THE DOCK & HARBOUR AUTHORITY

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Editorial Comments.

THE PORT OF KIEL.

The subject of this month's supplement is the Port of Kiel, which is situated at the Baltic entrance of the Kiel Canal.

This port attained fame in pre-war years as a great naval base and was also the centre of activity for the Kiel yachting regattas, which attracted yachts from several countries and was a spectacle of great splendour.

During the Great War of 1914-18 Kiel was the main base for the German High Seas Fleet and owing to its situation at the Baltic side of the Kiel Canal it was only approachable by the British Fleet through the Kiel Canal on the North Sea side and as this was heavily mined, Kiel proved itself a safe anchorage.

In those days Kiel's only interest was the German Navy and there was no thought for any commercialisation of the port, but since the war Kiel, through the loss of its navy, has had to turn its attention to industrial problems, thereby to resuscitate its financial position and also to find employment for its numerous population.

In the article which appears on another page, Mr. R. S. MacElwee, who has recently visited the port, shows how Kiel has turned over from a naval base to a thorough, hard-working and progressive commercial port.

The first part of this article is devoted to reconstruction, which has taken place during the past 10 years and during that time extensive harbour works have been constructed and a great revival set in. The old naval works have been reconstructed and they are now building merchant vessels and yachts. The civil population has increased as also has the number of workers, the latter by about 50 per cent.

The traffic of the port has likewise increased and from 1919-27 there was an increase of just over 600,000 tons of cargo handled at the port in a year.

Kiel relies upon its future as a port by its great possibilities as a trans-shipment port for Baltic shipping, as the large ocean-going vessels with cargoes consigned to the smaller Baltic ports are enforced through the shallow depth of water at these small ports to land their cargoes at Kiel from whence they are transferred to smaller boats for their port of destination.

The port's position on the Kiel Canal also brings a great amount of trade with the river and canal barges that traverse the canal.

The port of Kiel is divided into four parts: (1) The Old harbour, which is for the purpose of supplying the local consumption of the town and is equipped with nine electric cranes. (2) Wik Harbour, which is the Kiel Free Port and has been considerably developed. (3) The North Harbour on the canal which was constructed at great expense by widening the canal and is mainly equipped with sheds and warehouses. There is also a modern grain elevator with 12,000 tons capacity and two transit sheds adjoining with a capacity for 3,000 tons of vegetable oil and cotton seedcake. (4) The Vossbrook Harbour is located on land which the Imperial Navy Department had commenced to develop during the war as a shipbuilding yard for submarines, and was bought by the City of Kiel from the German Federal Government. This harbour is still under construction.

The Port of Kiel with all its reconstructions and additions and the thorough and whole-hearted way in which its civilian population has attempted to revive its fortunes should most certainly progress and prove a great commercial port.

NEW ORLEANS SHIPPING FOR THE FISCAL YEAR.

During the fiscal year ending August 31st, 1928, there were 2,946 deep-sea vessels of 10,983,338 gross register tons arriving at the Port of New Orleans, according to the records of the Board of Commissioners of the Port of New Orleans. Of the total tonnage, 9,153,311 used the public wharves of the Board, while the remainder were accommodated at private landings, principally industrial plants. These are figures available in advance of the compilation of the official report of the Board for the year. More than half of the tonnage was under the United States flag, with Honduran, British and Norwegian vessels in the next three positions.

There were 874 vessels which arrived with whole cargoes: 157 with oil, 47 with sisal, 166 with green fruit (bananas), 129 with sugar, 91 with molasses, 6 with coffee, 30 with logs (principally mahogany), 19 with nitrate of soda, 113 with bauxite (aluminium ore), 21 with phosphate rock, and 35 with various other commodities. Of the remainder of arrivals there were 615 with green fruit (bananas) and general freight, 786 with general cargo, 268 with cargo in transit, and 361 in ballast.

Departures in deep-sea trade during the fiscal year numbered 2,912 vessels, of which 132 sailed with whole cargoes; 62 with petroleum, 17 with steel, 17 with cotton and 36 with various other commodities. Remaining departures consisted of 1,989 vessels with general cargo, 120 with cargo in transit, and 616 in ballast.

The table of arrivals by flag and gross tonnage is as follows for the year:—

Flag.	No. of Vessels.	Gross Tonnage.
American	1,485	6,148,292
Brazilian	22	99,468
Belgian	10	51,287
British	217	996,811
Cuban	16	37,800
Danish	69	180,855
Dutch	46	251,979
French	52	336,710
German	48	195,038
Greek	3	13,832
Honduran	386	1,015,402
Italian	69	414,942
Japanese	15	112,543
Mexican	6	6,557
Nicaraguan	53	70,093
Norwegian	377	878,671
Panaman	18	18,252
Swedish	54	154,806
Total arrivals ...	2,946	10,983,338

CONTRACT FOR SINGAPORE BASE.

The Admiralty have just placed a contract in connection with the new naval base at Singapore with Sir John Jackson, Ltd., of Victoria Street, Westminster. The work is to be completed in seven years.

The naval part of Singapore Docks' scheme is estimated at a cost of £7,750,000 and the estimate comprises a naval base and its equipment of workshops, buildings, railways, roads, water supplies, etc.

The floating dock in connection with this scheme left the Tyne last June in two sections and we are able, on another page in this issue, to show two photographs of this floating dock passing through the Suez Canal.

CANADIAN PACIFIC RAILWAY.

The Canadian Pacific Railway launched a new liner at Clydebank on Friday, September 28th, the ceremony being performed by the Duchess of York, after whom the boat was named.

The liner, which is a 20,000-ton boat, was built by Messrs. John Brown and Co., and is the fourth of its class. It is intended for the Atlantic run and the St. Lawrence River route to Montreal.

The Canadian Pacific have greatly increased their fleet in recent years and this progressive policy of theirs has greatly benefitted British shipbuilding firms.

North-East Coast Notes.

NORTH-EAST COAST PORTS.

That the Tyne was ready for a revival in trade was a notable expression by Sir Edwin F. Stockton when, on September 6th, members of the Manchester Ship Canal Company visited the river as guests of the Tyne Improvement Commission, and made an inspection of its many outstanding features. Sir Edwin was proposing the toast of success to the Tyne Commission at a luncheon which was served on board the Commissioners' steamer "Sir William Stephenson," while the party were returning from their tour. Sir Edwin added that his eyes had been opened by what he had seen that day. The Tyne was ready for a revival in trade when it came. He believed the revival would come, but they must work for it. As business men they must do nothing to discourage those who were working hard for the revival.

Mr. H. P. Everett replied, and drew attention to the scope there was for new work on the banks of the river. They were concerned that shipyards were idle and still more concerned for the men out of work, for there were no better workmen in the world than those on the North-East Coast.

Sir William Noble also acknowledged the expressions of thanks by the guests, and said they had been told that no port in the country offered greater possibilities of development. At Jarrow Slake there were immense possibilities, and schemes of development there might involve ultimately an expenditure of between five and six million pounds.

Viscount Grey proposed the toast of welcome to the guests and success to the Manchester Ship Canal Company. He said they lived in days when things were changing, and it was important to all ports that they should be increasing their facilities and affording quicker discharging and loading. He hoped when the long-looked-for recovery in trade took place throughout the British Isles that both the Tyne and Manchester would be in the forefront of that prosperity.

Captain Bacon replied and said the Tyne has been favoured with strong men in the past to shape its destinies.

The stretch of the river from Scotswood to its mouth was reviewed by the visitors, and the Slake was by no means the least interesting feature. It was explained that there may be important developments there which may materially add to the prosperity of the Tyne. The preliminary investigations are tending favourably, and borings carried out by the Tyne Improvement Commission disclose rock foundations that augur well for the eventual use of the land.

BIG DISCHARGE OF OIL.

Apart from the expressions noted above of what can be done on the river proofs are not wanting in the form of actual accomplishments of its possibilities. The biggest discharge of oil ever made on the River Tyne was that from the tanker "Elax," of the Anglo-Saxon Petroleum Company, Limited, on August 24th. The vessel arrived with 4,500 tons of motor spirit from Curacoa for discharge at the Shell-Mex oil depot at Jarrow Slake. The spirit was pumped through an 8-inch. pipe for a distance of a quarter of a mile to the Company's new storage tanks, which have a capacity of 1,528,000 gallons, and the discharge was made at the rate of about 200 tons an hour. The "Elax" was the first ocean-going steamer to discharge oil at the depot.

There are prospects of considerable extensions in this area, and the sanctioning by the Ministry of Health of the construction of a light railway on behalf of the Mercantile Dry Dock Company across the east end of the estate will immensely facilitate developments and will enable Shell-Mex Company to instal plant for the making of lubricating oil.

A striking instance of the coal shipping capabilities of the river also was given in August. A Cairn liner, the "Cairngowan," commenced loading on August 9th, at 9.30 a.m., at Tyne Dock, and by 8 a.m. on the following day the vessel had taken in 6,000 tons of cargo coal and 1,400 tons of bunkers.

TYNE-CONTINENT SERVICES.

The new cargo service between the Tyne and Amsterdam was inaugurated by the Tyne-Tees Shipping Company at the beginning of September, with the dispatch from Amsterdam of the "Lowick." Good berthing accommodation has been secured at the latter place and large cargo sheds have been taken over. There are to be sailings from the Tyne every Tuesday and from Amsterdam every Saturday.

The development of the passenger traffic between the Tyne and Norway following the opening of the Commissioners' new quay at Albert Edward Dock, was illustrated by the departure on August 18th, of three Norwegian passenger steamers, the "Stella Polaris," the "Meteor" and the "Jupiter," which together had 500 tourists aboard. The direct train service between the quay and King's Cross, London, is a popular feature.

It is interesting to note that imports of iron and steel from abroad to the Tees continue to dwindle. Statistics presented at the meeting of the Tees Conservancy Commissioners on September 3rd, showed that during the ten previous months ended August 31st, the imports totalled 191,954 tons, a decrease of 141,906 tons as compared with the total for the corresponding period of 1926-1927. The total for the pre-War period of 1913—14 was 53,399 tons. There was a big fall in the imports of pig iron which amounted to 4,928 tons during the past ten months, as against 99,781 tons in 1926—27, and 312 tons in 1913—14.

BLYTH APPOINTMENT.

Blyth Harbour Commissioners have appointed Mr. G. D. Ross to the position of engineer rendered vacant by the resignation, through ill-health, of Mr. Nivison. Mr. Ross latterly has been Assistant Engineer to Leith Dock Commission, and previously had experience at Aberdeen and Newcastle. At a lunch which followed the meeting, held on August 21st, Mr. Nivison formally bade good-bye to the members of the Commission, and the Chairman (Mr. Ridley Warham), on behalf of the Commissioners, presented to Mr. Nivison a gold cigarette case in appreciation of his valuable services as Engineer to the Commission from 1914 to 1928. He expressed their regret that ill-health had caused Mr. Nivison to resign his position, but said the Commissioners hoped that residence in the South of England would enable him to recover it.

A figure well-known for many years in commercial circles on Tyneside was removed by the death, on September 7th, of Mr. John Hair Kirk McLean, M.B.E., at his residence, South Shields. Mr. McLean for 37 years had been manager of the graving docks department of Messrs. John Redhead & Sons, Ltd., shipbuilders and repairers, West Docks, South Shields. He was a native of Paisley, Scotland, and after a thorough training in ship construction and marine engineering with the firm of Messrs. Fullerton, he became manager for Messrs. Oswald & Co., shipbuilders and engineers, Southampton and Milford Haven. This post he resigned in 1891 to go to Tyneside as manager of Messrs. Redhead's graving docks.

Launch of a Submarine.

H.M. Submarine "Otus," one of the six "O" Class submarines ordered by the British Admiralty under the 1926 Naval programme, was launched from the Naval Construction Works, Barrow-in-Furness, on Friday, August 31st.

It will probably be remembered that of these six vessels one is being built in H.M. Dockyard at Chatham, three were ordered from Messrs. Vickers, Limited, and two from Messrs. William Beardmore & Co., Ltd., Dalmuir.

All three vessels ordered from Messrs. Vickers, Limited, have now been launched, the "Osiris" and the "Oswald" taking the water on the 19th May and 19th June respectively.

The christening ceremony was performed by Mrs. Grace, the wife of Rear-Admiral H. E. Grace, Admiral of Submarines, and at the luncheon which followed the launch she was presented with a diamond and sapphire pendant by Commander C. W. Craven, on behalf of the chairman and directors of the company, as a memento of the occasion.

In addition to Admiral and Mrs. Grace, the following guests were present:—Lady Louise Loder, Lady Moyra Cavendish and party, Miss Gladys Grace, Commander C. W. Craven (managing director of the Naval Construction Works) and Mrs. Craven, Miss L. M. Craven, Mr. G. W. Barr (special director) and Mrs. Barr, Mr. J. Callander (special director) and Mrs. Callander, Engineer-Captain and Mrs. A. E. Lester, Engineer-Commander and Mrs. L. Turner, Commander A. S. Lindsell, Engineer-Commander and Mrs. L. Thackara, Engineer-Commander D. P. Rowland, Lieut.-Commander G. Arroyo (Chilean Navy), Mr. and Mrs. C. H. Leddra, Captain Fisher, Mr. W. F. Rabbidge, Lieut.-Commander and Mrs. A. S. Cumming, Mr. J. A. Cumming, Mr. J. M. Ormston, Mr. D. McLachlan, Mr. W. Johnson and Mr. R. G. Hinds.

Messrs. Vickers-Armstrongs, Ltd., also have under construction four "P" Class submarines for the British Admiralty, which were ordered under the 1927 Programme, and three submarines of the "O" Class for the Chilean Government, the first of which will be launched at the beginning of October.

Details of the British submarines are not, of course, available for publication.

THE JUNIOR INSTITUTION OF ENGINEERS.

Lieut.-Colonel J. T. C. Moore-Brabazon, M.C., M.P., has accepted the invitation of the Council to become President of the Institution in succession to Sir Murdoch MacDonald, K.C.M.G., C.B., M.P. His induction will take place at a meeting to be held at the Royal Society of Arts on Friday, the 7th December, when he will deliver his address.

The opening meeting of the 48th Session will be on Friday, 5th October, 1928, at 39, Victoria Street, S.W.1, at 7.30 p.m. Lecture, "Interesting Details of Swiss Alpine Railways," by A. J. Simpson (member), illustrated by special slides.

Kiel Changes over to a Commercial Port.

By R. S. MacElwee, Ph.D., Commissioner of Port Development of the City of Charleston, South Carolina.

I.—RECONSTRUCTION.

THE CITY OF KIEL is a modern example of beating spears into plowshares and swords into pruning hooks. The Imperial German Navy within a generation brought Kiel up from a small fishing village to one of the greatest naval bases and a city of 250,000 inhabitants. This city lived by, from, and for the navy, *die Kaiserliche Marine*. The great Germania Werft, one of the world's greatest shipyards, turned out battleships and cruisers.

Photo by] [Author.
Old Town Harbour from Hotel Balcony at Union Station.

The deep water of the Kiel Harbour was the anchoring place for the German High Seas Fleet. The presence of the fleet, the beauty of the harbour, and the fine climate as a summer resort combined to make Kiel a great watering place where the famous Kiel Sailing Regatta took place each year drawing together the smart set of the world. To accommodate the personnel of the navy and the many visitors of distinction, great hotels were built. Kiel flourished as a navy town.

And then came the fall. The German Navy was reduced to a few obsolete vessels. The floating population of Kiel in connection with the navy drifted away and left the civilian working population of artisans and storekeepers with all of those activities necessary to support a large population and a great shipbuilding industry. It was a grave economic crisis.

During the splendid days of the Great Fleet only the inner harbour had developed as a commercial port for local distribution of supplies of the city and its visitors. The navy had crowded out ocean shipping until it had almost ceased to exist because merchant shipping was in the way. With these handicaps the City of Kiel as a community went to work to capitalise upon the same natural advantages that had made Kiel the great naval base; the magnificent Kieler Fjord, a deep bay completely land-locked, with a deep, narrow entrance protected by low-lying, wooded hills and located at the Baltic end of the Kiel (Kaiser Wilhelm) Canal. The geographical location with regard to the Scandinavian and all the other

Photo by] [Author.
Old Town Harbour, showing Germania Works.

Baltic states, old and new since the World War, is very favourable. The probable increase in their purchasing power offered good trading markets for the future. These are all real values capable of capitalisation. Therefore the city went to work to build port facilities and tell the world that Kiel was no longer an anchorage for battleships and a bay for sailing regattas, but a commercial seaport equipped for merchant shipping and a great distributing point for the entire Baltic.

For an instance of intellectual reconstruction take the Institute of World Economics, *Institute fur Weltwirtschaft und Seeverkehr*, with its World Economic Archives (*Weltwirtschafts Archiv*) of the University of Kiel. Under the able and energetic guidance of Dr. Bernhard Harms and his able assistant, Prof. Dr. Fleck, this college has won world-wide fame. It now occupies the once famous Krupp Hotel and the

Photo by] [Author.
South Wharf of Freeport Pier in Wik Harbour.

former Imperial Yacht Club, next door. The mere locale of this one example paints a picture of Kiel's intellectual reconstruction as part of the new, post-war, progressive, intellectual world. This affiliated branch of the University of Kiel consecrated to intensive study of world economics and ocean shipping is housed in the very halls that once held the official banquets of Emperor William and his distinguished guests.

The old *Kaiserliche Werft*, builder of battleships, *has passed over to the German Stock Company* that now builds merchant vessels and yachts, Diesel motors, electrical motors, electrical and Diesel-electric railway cars, benzol-burning motors, passenger cars, electrical goods and even metal furniture.

Within the short space of 10 years since the Armistice, a period of time very long in the experience of the inhabitants, but short in the life of the city, the City of Kiel has constructed extensive harbour works and a free port for ocean commerce and established an active business getting bureau. The results are already quite evident from the statistics. Kiel's efforts to change from a naval base to a commercial port have been successful, if population and employment statistics are of any

Photo by] [Author.
North Wharf of Freeport Pier in Wik Harbour, with Director of Port (M. Langrihr) and the Publicity Director.

value. Much of the glamour may be gone, but the full dinner paid is more important than glamour. Given a good harbour with a favourable geographical location with regard to a trading area, the construction of port facilities, and a campaign to inform the public of the advantages of the port, port development will meet with success.

THE GROWTH OF THE CIVIL POPULATION.

	Persons.
1871	31,764
1900	97,700
1905	145,553
1910	186,707
1917	203,670
1922	203,821
1924	220,000
1925	215,769
1926	215,722
1927	215,373

INCREASE IN WORKERS.

	Persons.	
1882	8,000	
1895	15,000	
1907	35,000	
1914	40,000	Over.
1922	50,000	
1923	53,000	
1924		
1925	60,000	
1926		
1927		

North Harbour from hillside that is being removed for the extension of the Harbour.

THE HARBOUR OF KIEL.

The Lightship "Kiel" (or "Buelk") is anchored at 54 degs. 29 mins. north, 10 degs. 16 mins. east. The lightship gives international Morse signals, and intermittent lights at night. It also sends and receives wireless messages with regard to navigating of the vessel. The naval station for wireless messages and information on the old fortress wall off the lighthouse at 54 degs. 24-ft. north, and 10 degs. 11-ft. east, open day and night, gives marine information and radiograms. This station gives warnings, flags by day, and signals by night. Characteristic is a mast with yard. It also furnishes ice signals and ice information service.

The harbour of Kiel is a wonderful natural harbour. The channel is clearly marked. The quarantine anchorages are carefully marked. The holding ground is good. There is no tide. The entire German High Seas Fleet formerly anchored comfortably in this harbour.

SERVICES TO SHIPPING.

During the pre-war period of international competitive naval construction great shipyards grew up in Kiel. These are the Friedrich Krupp, A. G., Germania Werft, the German Works A. G. Kiel Yard, the Howaldts Works, and several smaller ones, such as the Kolbe Dockyard, and Yacht Dockyard Waap. The Krupp-Germania Yard has three floating dry docks with lifting capacities up to 4,200 tons and a graving dry dock for vessels not exceeding 200 metres (660-ft.) in length. The German Works Kiel Yard has five floating docks up to 2,400 tons capacity and six graving docks accommodating vessels up to 175 metres (577-ft.) in length. Also there is a marine railway for vessels of 50 metres (165-ft.) in length. The Howaldts Works have two floating docks, and the Kolbe Yard one.

There are numerous floating and stationary cranes with capacities up to 250 tons.

Also there are a number of marine engine manufacturing plants: Bohn and Kaehler, Neufeldt and Kuhnke, and Wilh. Poppe, which manufacture engines, auxiliary engines, ship motors, transport motor cars, motors for polyphase, alternating electric current, telephone apparatus, etc. Kiel to-day is probably the most efficient merchant vessel repair yard to be found due to the high degree of perfection to which it was developed before and since the World War.

III.—TRAFFIC OF THE PORT OF KIEL.

The Port of Kiel bases its faith in the future upon its ability to function as the port for transhipment trade. The distinguishing characteristic of Baltic shipping is that there are many small ports accommodating only small draft ships. A steamship service must make many ports of call. It is obvious that the high-sea long-voyage type of vessel of large cargo capacity would be unprofitable in this kind of trade. It is more economical for these vessels to proceed to the entrance at the Baltic end of the Kiel Canal, to Hamburg or to Copenhagen and discharge their cargo into warehouses for transhipment to feeder lines serving these numerous Baltic ports. Kiel, therefore, bases its reason for existence upon this service as a cross road and breaking-up point between large long-voyage vessels and smaller coastwise feeder liners. The Port of Kiel has already regular liner connections with the following ports, direct or by transhipment:

(1) German Baltic: Orth, Heiligenhafen, Burgstaken, Lubeck, Kappeln, Flensburg, The Isle of Fehmarn, Rostock, Stralsund, Anklam, Demmin, Wolgast, Greifswald, Kolberg, Stolpmunde, Stettin, Danzig, Konisberg. (2) German North Sea ports: Emden, Hamburg, and Bremen. (3) To all Rhine harbours, lower and middle Rhine: Rotterdam, Amsterdam, Antwerp, Cologne, Dusseldorf, Duisburg-Ruhrort, etc. (4) To Danish ports of: Copenhagen, Naskaiv, Odense, Aalborg, Aarhus, Vejle, Kolding, Hadersleben, Apenrade, Sonderburg, Faaborg, Svendborg, Korsoer, Randers, Kallindborg, Middelfart, Horsens, Fredericia. (5) To Finnish ports of: Helsingfors, Kotka, Wiborg, Hango, Abo. (6) To Swedish ports of: Malmö, Gotenburg, Norrkoping, Stockholm, Landskrona, Helsingborg, Halmstad, Falkenberg, Trollhattan, Otterbaken, Karlstad, Lacffle, Kristinehamn. (7) To various other ports of importance, such as: London, Hull, Rouen, Le Havre.

These lines give at least a semi-monthly service and frequently sailings a week.

The City Bureau for Commerce and Industry created as the port development bureau of the City of Kiel, is bending every effort to interest the shipping lines that pass through the Kiel Canal to tranship at Kiel. This sales effort on the part of the city has been increasingly successful as the statistics of the growth of the port will show. The tons of cargo handled at the Port of Kiel increased over twelve-and-a-half times from 51,686 metric tons in 1919 to 654,563 metric tons in 1927.

CARGO HANDLED AT THE PORT OF KIEL IN METRIC TONS.

1919	51,686
1920	57,861
1921	45,551
1922	136,735
1923	392,800
1924	727,300
1925	580,951
1926	586,152
1927	654,563

The Port of Kiel at the Baltic end of the Kiel Canal relies largely upon the tonnage attracted by the canal for this growth. The same geographical factors that made the canal of such great strategic importance to the Imperial Navy now act equally favourably upon its commerce. An idea of the amount of traffic through the Kiel Canal is shown by the table of the number of vessels and their registered tonnage:—

Year.	No. of Vessels.	Reg. Tonnage.*
1912	57,366	9,924,237
1913	53,382	10,349,929
1914	27,395	4,227,513
1915	16,208	3,944,930
1916	18,546	4,979,174
1917	18,597	5,505,528
1918	15,929	4,720,132
1921	32,255	9,484,000
1922	39,048	12,805,000
1923	40,622	14,791,549
1924	45,863	14,072,215
1925	42,288	14,694,673
1926	49,420	18,906,243
1927	53,422	19,880,625

* Kiel Canal German measurement tonnage rules.

KIEL HARBOUR & CANAL.

HARBOUR UNDER THE JURISDICTION OF THE CITY BUREAU FOR COMMERCE & INDUSTRY.

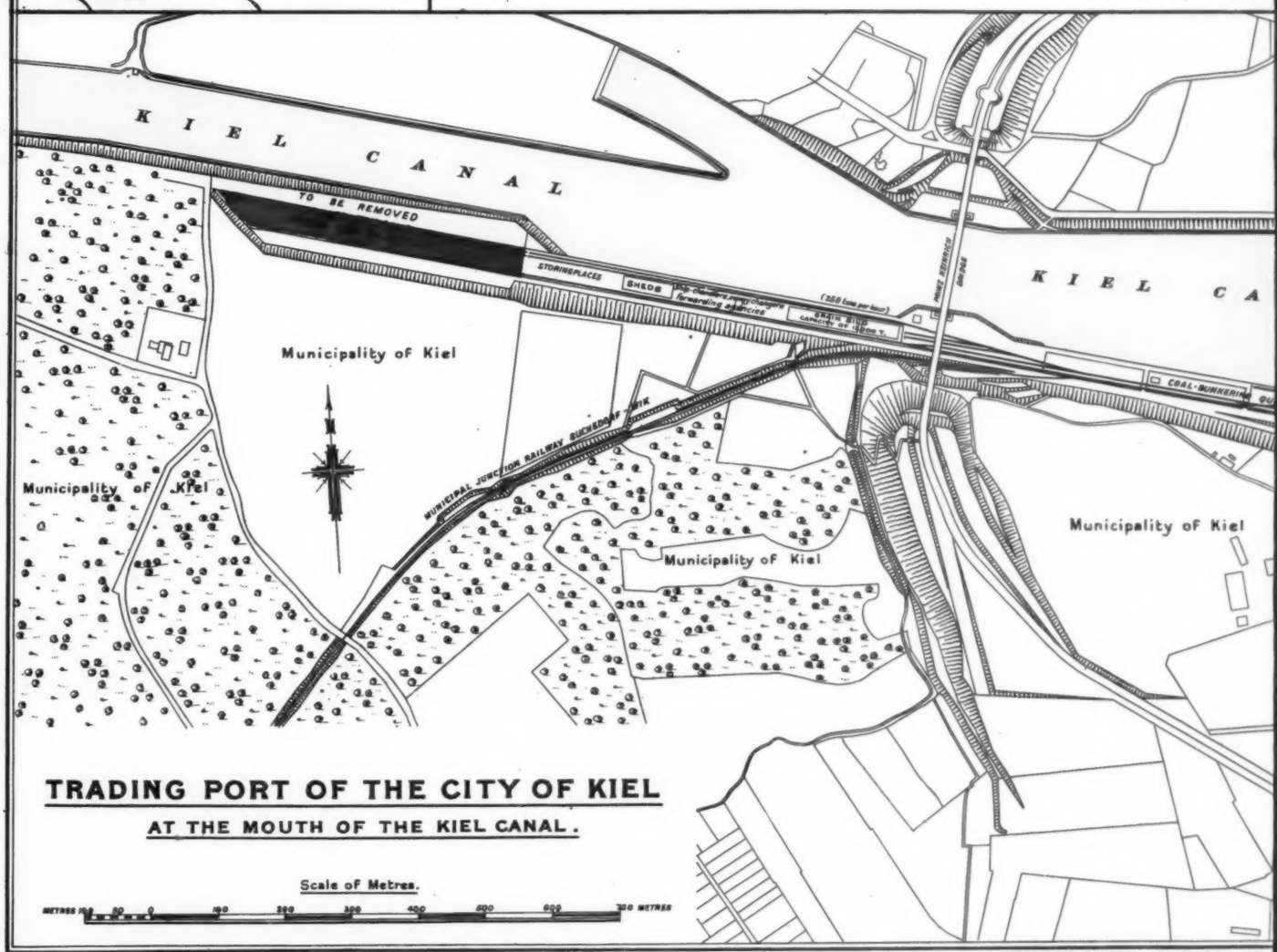
Canal Agents;– Paulsen & Ivers, Canal Office, Brunsbüttelkoog.

PLAN OF KIEL

DRY DOCKS, CRANES ETC.

Krupp – Germania, 3 Floating Dry Docks u
Dry Dock 200 (660 Ft.)
German Works – Kiel Yard, 5 Floating Dry Docks
6 Dry Docks up to 175

Floating & Stationery C



TRADING PORT OF THE CITY OF KIEL

AT THE MOUTH OF THE KIEL CANAL.

Scale of Metres.

WARD & FOXLOW, Harcourt St. Marylebone W.1.

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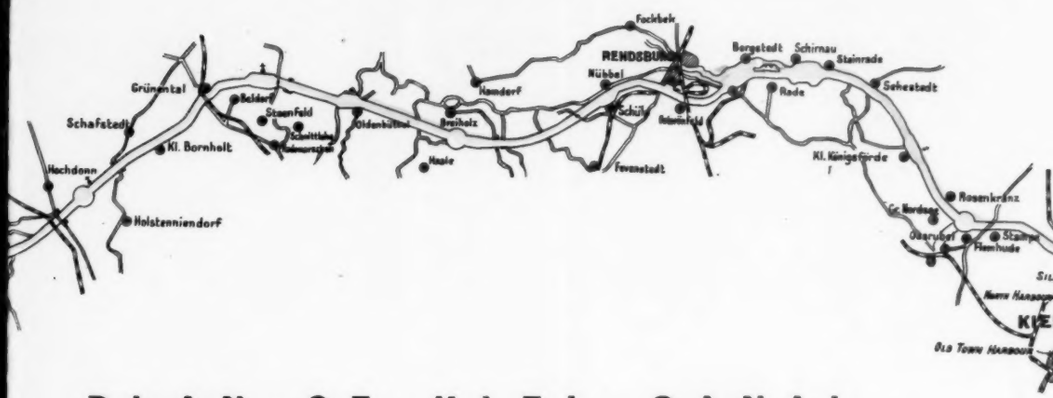
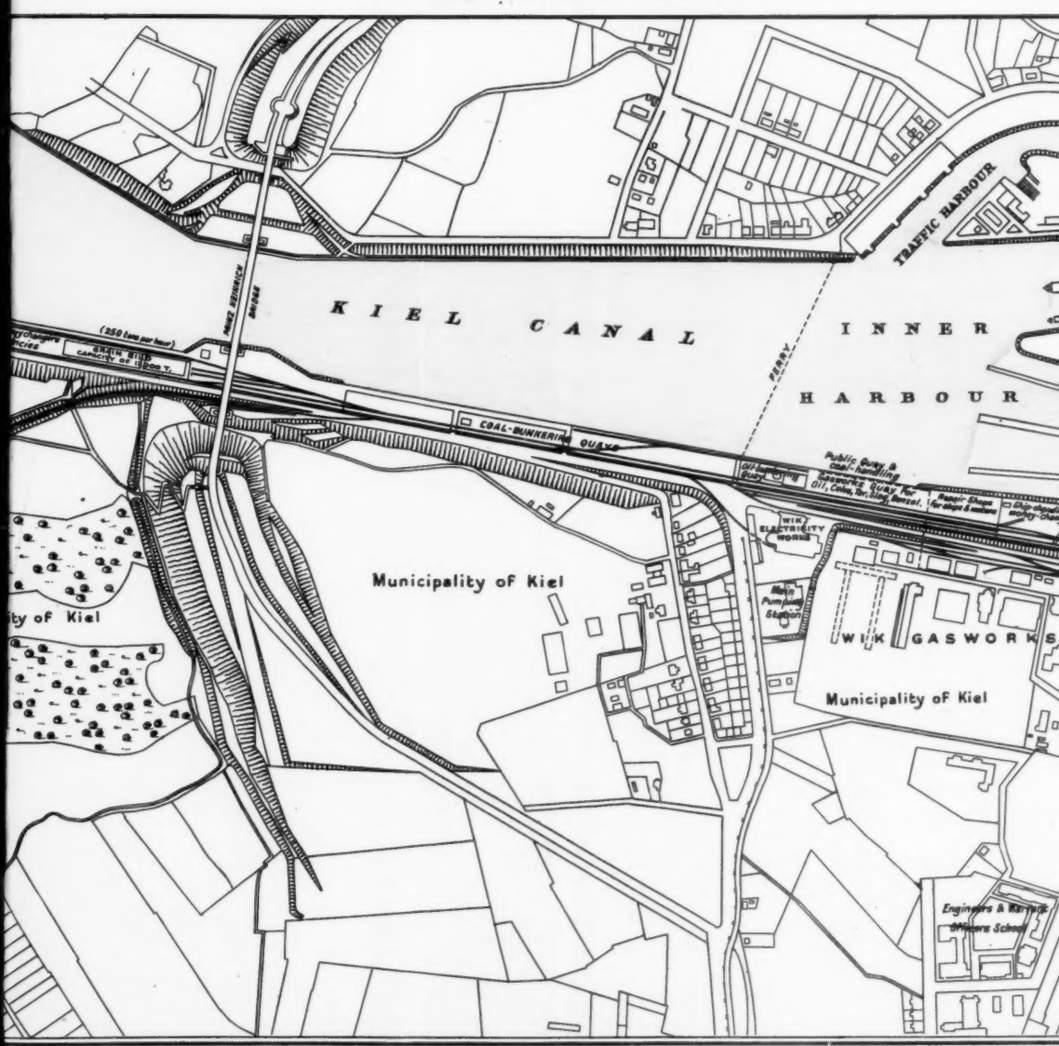


PLAN OF KIEL CANAL.

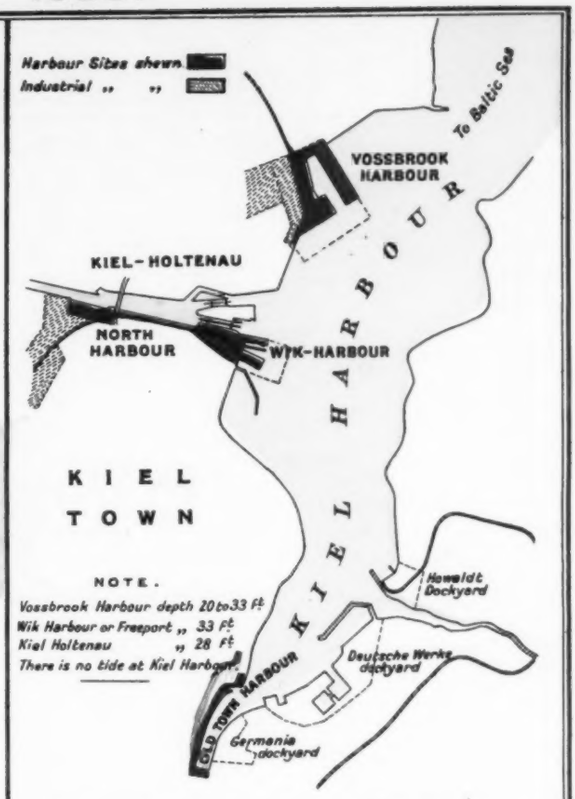
DRY DOCKS, CRANES ETC. AT KIEL.

Krupp - Germania, 3 Floating Dry Docks up to 4200 tons.
Dry Dock 200 (660 Ft.) metres.
German Works - Kiel Yard, 5 Floating Dry Docks up to 2400 tons.
6 Dry Docks up to 175 (577 Ft.) metres.

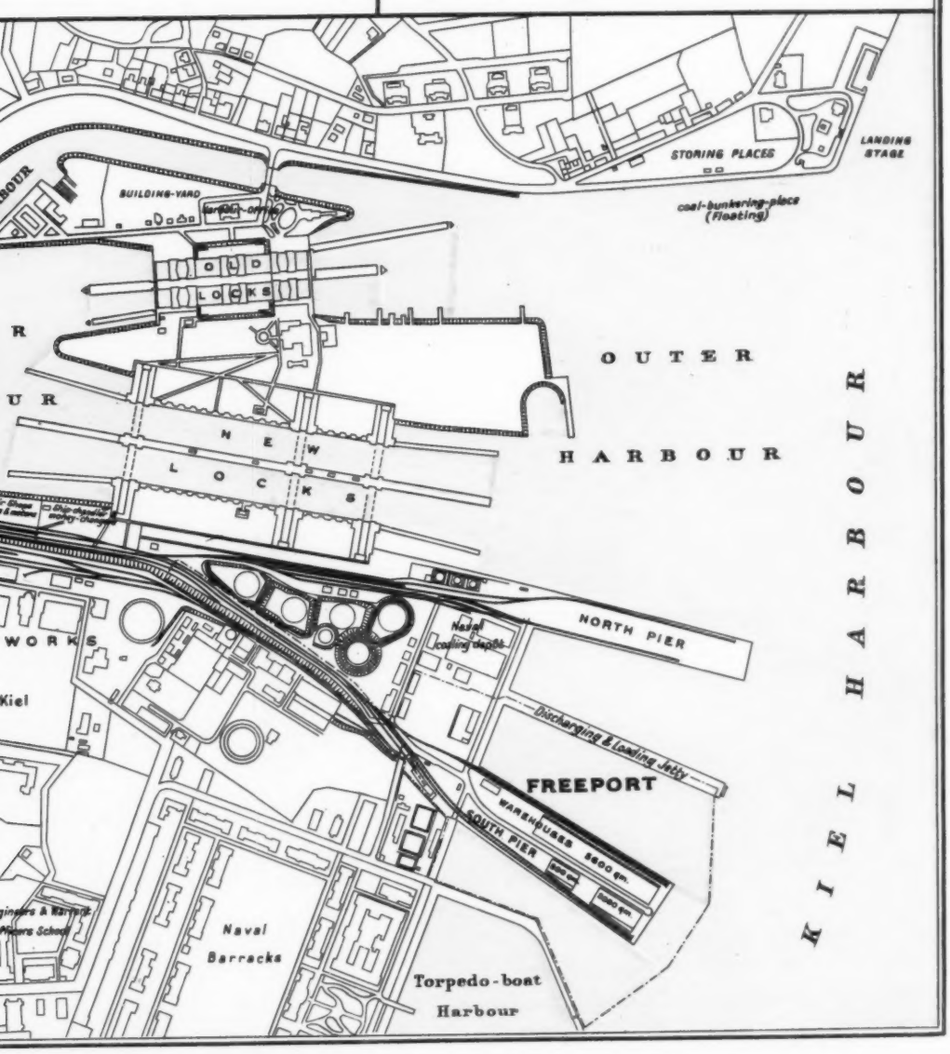
Floating & Stationery Cranes up to 250 tons.



WARD & FOXLOW, Harcourt St. Marylebone W.1. 5192.

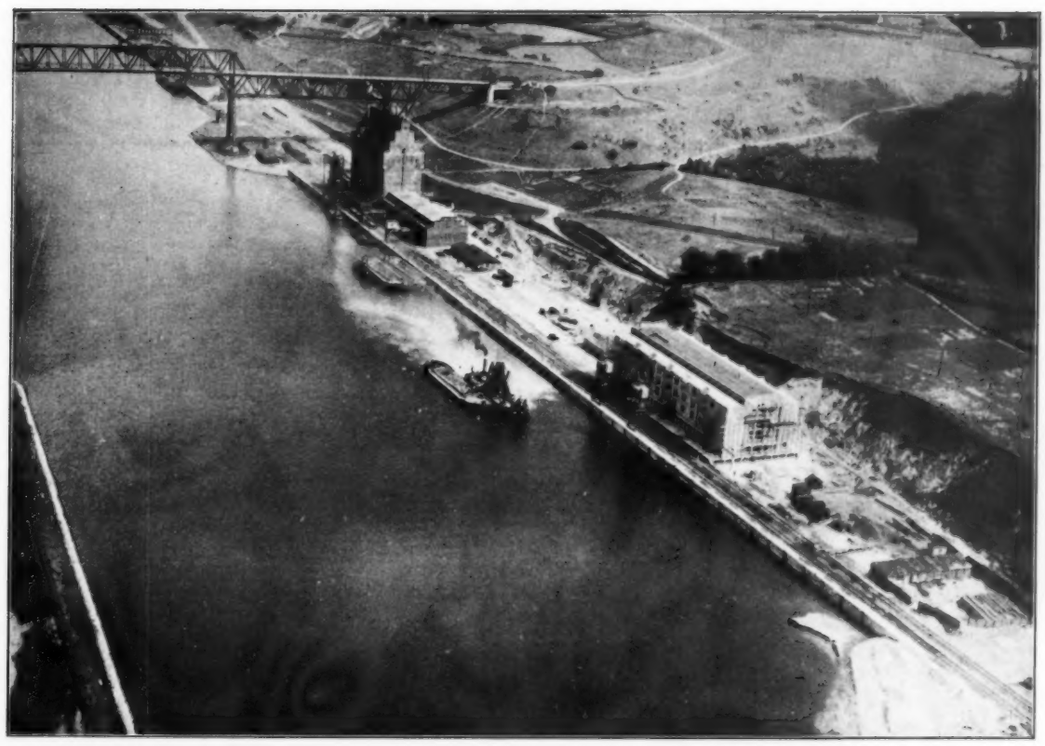


PLAN OF THE HARBOUR.



The Port of Kiel.

Wik Harbour and Holtenau Locks to the Kiel Canal.



North Harbour on the Kiel Canal, from the air.

Some of the advantages of the Kiel Canal as published by the selling organisation for the Port of Kiel may be profitably enumerated. One chief advantage is the fact that the higher insurance rates on Baltic shipping, due to the treacherous nature of navigation of the Baltic Sea with its islands, shoals, ice and the difficult entrances of most of its harbours, do not apply until after the vessel has passed through the canal and left the harbour of Kiel and entered into the Baltic. In other words, high sea shipping premiums apply to and including Kiel on a parity with the two other modern competitors, Copenhagen and Hamburg. If the vessel proceeds into the Baltic, the higher Baltic insurance rate applies. This increased rate reinforces the operating economy of stopping the large, long-voyage vessel at Kiel for transhipment to the smaller Baltic vessel.

Kiel is no farther from Atlantic shipping than Hamburg and a vessel may be in Kiel in the same time that it takes to reach Hamburg. Goods bound for the Baltic discharged at Kiel for transhipment are closer to their destination by as much as the distance from Hamburg to Brunsbüttel and the length of the Kiel Canal to Kiel. Hamburg, since the Eleventh Century, at least, has been the free port that has served as the great transhipping point for Baltic commerce. In fact, the early rise of Hamburg, founded in 811 A.D., and the later Hanseatic supremacy of Lübeck during the Middle Ages, was due to the Hamburg-Lübeck transhipment trade between Flanders and the north.

Compared with Copenhagen vessels from the Atlantic engaged in the Baltic trade save at least 24 hours in time and avoid the dangerous passages through the Big Belt and the Little Belt, or the Kattegat and the Skagerak, known as " the Graveyard of Shipping." A table showing the calculations of these savings in distance and in time is detailed herewith:—

From.	When Using the Kiel Canal.		When Sailing round the Skaw.		Shortening of Distances when Using the Canal.	
	Length of the Route Sea Miles.	Running Time Hours.	Length of the Route Sea Miles.	Running Time Hours.	Length of the Route Sea Miles.	Running Time Hours.
Hamburg	221	29¾	646	78¼	425	48¼
Bremerhaven	272	36	595	72	323	36
Emden	346	45	629	76¼	283	31¼
Amsterdam	450	57¾	687	83¼	237	25½
Rotterdam	479	61	716	86½	237	25½
Antwerp	540	68½	777	94	237	25½
Dunkirk	561	71	800	97	239	26
London	591	74½	830	100¾	239	26
Hull	536	68	717	87	181	21
Hartlepool	571	72½	692	83¾	121	11¼
Newcastle	591	74¾	698	84¼	107	9¾
Leith	646	81¼	730	88¾	84	7¼

The calculations are based on an average speed of 8.25 nautical miles per hour for the canal. Fifteen kilometres per hour would be 8.1 knots. Three hours have been included for the delays at the locks.

RAIL CONNECTIONS.

The rail connections from the Port of Kiel over a harbour belt railroad to all of its terminals, are: Flensburg and the Jutland Peninsula of Denmark, to the north; Rendsburg-Hinsim to the west; Hamburg, Hanover, Bremen, etc., to the south; Berlin via Lübeck or Hamburg to the south-east (State railways).

INLAND WATERWAY CONNECTIONS.

It is obvious that thousands of Elbe, Elbe-Oder, Elbe-Spree-Oder river and canal barges may load at Kiel and pass through the Kiel Canal and over to the River Elbe past Hamburg as easily as the same barges can load at Hamburg. In case it is cargo from Atlantic shipping discharged at Kiel there must be added the time of the back haul through the canal. But in the case of Baltic shipping discharging at Kiel, the distance travelled by merchandise would be the same whether transhipped at Kiel or at Hamburg.

CAR FERRIES.

Rail connections by car ferry are at present of minor importance. Car ferry transportation is receiving much attention in various sections of the world and is capable of considerable development.

THE NATURE OF THE TRAFFIC AT THE PORT OF KIEL.

German lumber imports before the War came from Russia, especially from Finland, from Sweden and Norway, through the Baltic ports of Danzig, Stettin, Lübeck and Kiel. Following the War, Kiel put its energies immediately to the development of its lumber imports as a basic cargo for its shipping, capitalising the political fact that the German troops assisted the Finns in their war for independence against Russia. The German flagships in the Baltic were too small to attract any attention at Versailles and were not confiscated. This gave Kiel the necessary small vessels to develop these lumber imports. The hinterland of Kiel, largely an agricultural country, extending from the Danish border down into Hanover is a territory requiring large quantities of lumber. This gave Kiel the necessary basic cargo to develop steamship lines.

Cattle feed, especially cotton, seed, cake and meal, is an article of import from the Atlantic side to feed the famous black and white-spotted Holstein herds of Schleswig-Holstein. The Associated Agricultural Societies of Schleswig-Holstein have established directly on the canal a grain silo and transhipping warehouse with modern electrical handling machinery to serve this agricultural hinterland.

Coal imports of Kiel have always been very great because of the High Seas Fleet. Coal imports now have been developed for the peaceful purposes of the commerce of the canal and the Baltic seaports. The splendid coal harbour of the former Imperial German Navy has continued in use for this commerce.

IV.—TERMINAL FACILITIES AT THE PORT OF KIEL.

The Port of Kiel is divided into four parts: (1) the old harbour, the commercial harbour of the City of Kiel at the bottom of the Fjord; (2) the Wik Harbour and Free Port of Kiel at the mouth of the canal on the Fjord side of the locks; (3) the North Harbour at Kiel-Holtenau on the south bank of the canal within the locks, and (4) the Vossbrook Harbour, north of the canal, near the mouth of the Fjord.

1. The Old Harbour, now as before, serves to supply the local consumption of a town of one-quarter million people. It has 7,550-ft. of vertical masonry quay walls parallel with the shore with 20-ft. depth of water alongside. It is fitted with nine electric cranes and a marginal waterfront quay driveway. There are a number of well-constructed brick and stone transit sheds.

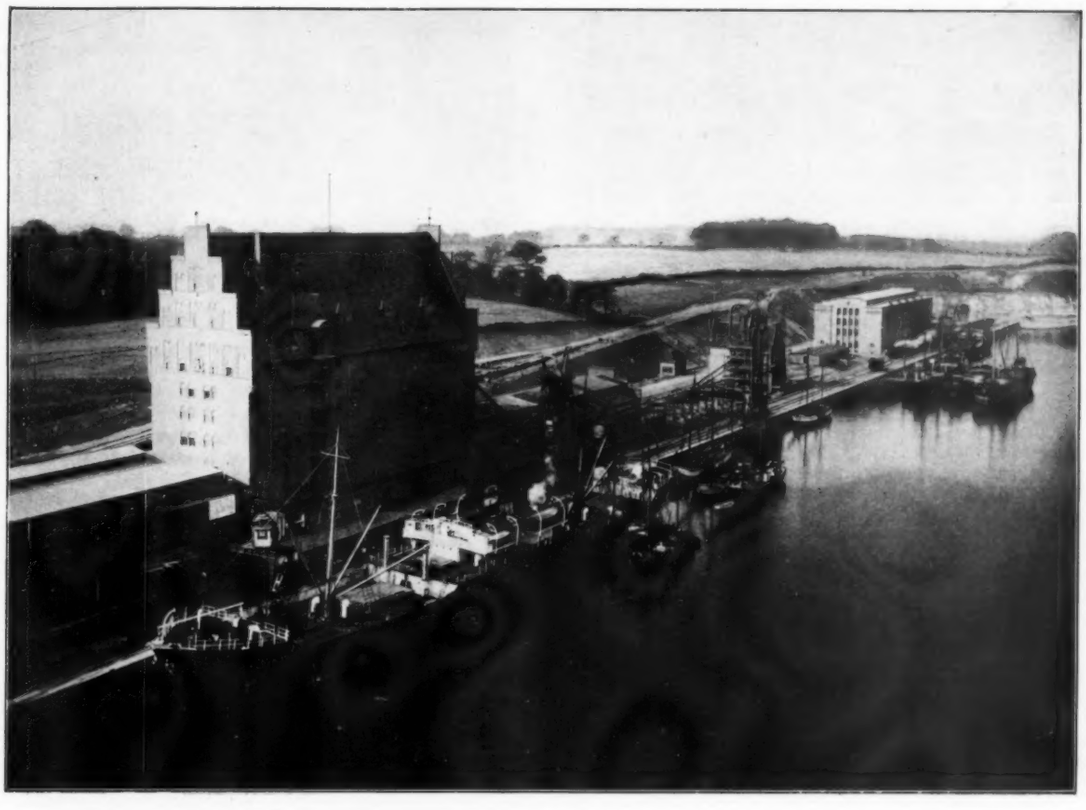
2. The Wik Harbour, which is the Kiel Free Port, consists of a new quay-pier the extension of former coal bunkering trestles of the old days which have been retained to fuel vessels transiting the Kiel Canal. The Kiel Free Port has 3,300-ft. of quay berthing space with 33-ft. of water and 18,500 sq. ft. of transit sheds and warehouses. It also offers 602,000 cubic feet of oil tanks and oil bunkering equipment. The quays are equipped with six electric dockside cranes.

3. The North Harbour on the canal was constructed at great expense by widening the Kiel Canal above the Kiel-Holtenau bridge, where the canal banks are high. This harbour consists of a masonry quay paralleling the canal 1,650-ft. long with 28-ft. of water alongside. It is equipped with sheds and warehouses with a floor area of 81,300 sq. ft. and a grain elevator of 12,000 tons capacity. The handling equipment consists of nine electrical warehouse cranes and the necessary shipside and transit shed tracks. This harbour is operated almost entirely by the United Schleswig Holstein Dairy Associations and the Kiel Warehouse Company both with preferential rights. This North Harbour, or Canal Harbour, is being extended nearly a mile, 1,500 metres (4,900-ft.). Inasmuch as the banks of the Kiel Canal at this point are 17 metres high (55-ft.) the construction of the harbour requires heavy excavation. The work now in hand requires the movement of 700,000 cubic metres of earth. The city considers the advantage of the location directly on the canal together with the opportunity of employing a portion of the city's 8,000 unemployed as a compensation for the heavy expenditure involved in cutting down these 56-ft. high banks to quay level. Public municipal warehouses, at the present time lacking, will be added to the North Harbour after the completion of the quay extension.

The plant of the *Vereinigten-Schleswig-Holsteinischen* Meierei-Verbände (The United Schleswig-Holstein Dairy Associations) consists of a modern grain elevator with 12,000 tons (480,000 bushels) capacity.* It has two marine legs of 150 and 250 tons an hour capacity (6,000 bushels and 10,000 bushels). With the grain elevator are two adjoining transit sheds with capacity for 3,000 tons of vegetable oil and cotton seed cake. These sheds contain modern feed cake grinding and mixing machinery with a capacity of 15 tons an hour.

* About 40 bushels—one ton.

The Port of Kiel.



North Harbour from Kiel Holtenau high bridge.

North Harbour Quay on Kiel Canal. The Prince Heinrich vehicular bridge has a vertical clearance of 138 feet.

The Kiel Warehouse Company, adjoining the grain elevator, operates a four-storey warehouse with a total floor area of 7,000 square metres (75,320 sq. ft.), and a storage capacity of 15,000 tons. This company owns two half-portal warehouse cranes and the city two additional cranes of 1½ tons and 2½ tons lifting capacity that are leased to the warehouse company.

Photo by] [Author.
Shipside Tracks and Crane Equipment, North Harbour, on a foggy morning.

4. The Vossbrook Harbour, at the mouth of the Fjord, has under construction 5,100-ft. of quays with 20 to 33-ft. of water and 250 acres of industrial free-port sites. For the construction of this harbour, the City of Kiel acquired the land which the Imperial Navy Department had started to develop during the War as a shipbuilding yard for submarines. The City of Kiel bought this property outright from the German Federal Government. Over 200 metres (660-ft.) of quays have already been constructed. To protect the harbour from storms coming in through the mouth of the Fjord, a combination breakwater jetty with loading quay inshore is under construction. This jetty is 20 metres (66-ft.) wide and will be 1,000 metres (3,300-ft.) long. Seven hundred metres (2,310-ft.) have been finished (end October, 1927), and the work is in progress. The materials for the construction of this combination jetty are taken from the levelling of the land for industrial sites. To level this industrial area to the elevation of the quay coping and to construct the breakwater requires the movement of approximately one-and-a-half million cubic metres (1,650,000 cubic yards) of material. This work is considered also as an aid to alleviate unemployment. The Vossbrook Harbour has direct rail connections with the Kiel Flensburg railway system.

The total of these improvements gave Kiel in 1925, 4,070 metres (13,431-ft.) of quay walls compared with 2,300 metres (7,590-ft.) in 1914; 26,900 square metres (281,444 sq. ft.) of transit shed floor area in 1925 as against 4,800 metres (81,648-ft.) in 1914, and a storage capacity of 50,000 tons of merchandise compared with 6,000 tons in 1914. The grain elevators have a capacity of 12,000 tons (480,000 bushels), all entirely new. Fifteen electric cargo cranes of one, two and two-and-a-half tons compared with three cargo cranes in 1914.

Photo by] [Author.
Shipside Tracks and Crane Equipment, North Harbour, on a foggy morning.

A ship side grain milling plant in the inner harbour has a marine leg with a capacity of 25 to 30 tons (1,200 bushels) an hour. The apparatus for the mechanical handling of coal in bulk at the mouth of the canal, has a capacity of 80 tons an hour.

The four parts of the Port of Kiel have a sort of division of labour agreement:—

1. The inner harbour serves local consumption and production.

2. The Free Port, or Wik Harbour, serves for storage in transit and the transhipment of general cargo.

The Free Harbour was opened at the beginning of 1923.

Year.	No. of Ships.	Net Registered Tons.	Tons of Cargo.
1923	437	31,383	5,189
1924	815	66,619	11,852
1925	535	101,967	29,472
1926	1182	159,877	26,424
1927	696	101,920	11,525

3.—The North Harbour on the Canal, in addition to grain and feed for the dairy farms, serves also for parcel freight as a port of call for vessels passing through the canal and making only a short stop. Vessels can load or discharge small quantities while waiting to pass the Holtenau locks.

The North Harbour was opened at the end of 1922. The traffic increased as follows:—

Year.	No. of Ships.	Net Registered Tons.
1923	968	184,882
1924	1,427	240,082
1925	1,553	297,432
1926	1,861	479,154
1927	2,566	798,869

The amount of goods handled at the North Harbour has increased from 157,000 to 261,000 tons during this time. This is a more sound statistical computation as statistics of vessel movements may include many times the same vessels, or boats, not actually employed in the cargo carrying trade.

From the standpoint of terminal engineering, there is little of specific interest in the Kiel harbour. Vertical quay walls, either marginal quays, or quay piers, are of the permanent concrete and masonry construction throughout, utilising various

Photo by] [Author.
Pneumatic Grain Elevator, North Harbour.

familiar systems of quay designs, such as at the neighbouring ports of Hamburg, Copenhagen, etc. As will be seen from the photographs, the transit sheds and shipside warehouses are set back thirty to forty feet with two ship-side tracks at quay level, spanned by portal or half-portal gantry cranes with very wide loading platforms at car floor level, and transit shed floors at car floor level. This is the system used with shore cranes loading and discharging the vessel, lifting the drafts across the quay level tracks to car floor level transit shed floors. On the other hand, where ship's tackle is used for loading and discharging, the transit shed floors should be at quay level, and the quay paving and channel rail tracks should be flush, permitting easy hand truck or industrial truck passage across them.

V.—THE NORTHLAND FAIR AND PORT DEVELOPMENT.

NORDISCHE MESSE.

Another post-war activity of the City of Kiel to secure business for the port was the foundation of the Northern, or Nordic Fair, in 1921. The North Sea-Baltic sample fair, along the lines of older and famous sample fairs, such as the Foire de Lyons, Liepziger Messe, Kölner Messe, and others, was started through the co-operation of business and manufacturing firms to establish new business connections throughout the North of Europe, the trade area of the port. The fair was energetically pushed and with the help of excursion rates and good advertising, it increased in size. After a short time it became a semi-annual market, and the categories of merchandise were extended in scope.

In 1925 a large modern exhibition building (Messe Halle) was constructed, near the Gutenberg Square, 180 metres (600-ft.) long and with a floor area of 8,000 square metres (86,000 sq. ft.). This new exhibition hall embodies all the latest improvements known to sample fair exhibition buildings. It has reading and writing rooms, rest rooms, a press room, a restaurant, direct railroad spur sidings, a 5-ton crane to

assist in setting up heavy exhibits. An open area of 760,000 sq. ft. (70,000 sq. metres) adjoining accommodates agricultural machinery and similar outdoor exhibits.

Photo by] [Author.
Completed Retaining Wall in Vossbrook Harbour.

After the stabilisation of the Reichsmark large commercial and industrial firms endeavoured to cut down the number and concentrate the numerous fairs, markets and exhibits. The burden and expense of exhibiting at many fairs had become unsupportable. The City of Kiel acquired all the stock of the Nordic Fair and changed its character from a sample wholesale and retail sales fair to periodical trade exhibitions. The efforts of the management are now directed toward these ends. First: That Kiel be given serious consideration as a meeting place for all conventions and exhibitions that are planned by any commercial or industrial associations of their own volition. This is quite similar to the activities of the Grand Central Palace, in New York City. Some of these, such as the National Advertising Show, meet annually in various sections of the country as migratory exhibitions. Second: To attract to, or promote in Kiel, such exhibitions as have a special interest in the locality of which Kiel is the port, or the metropolitan market, such as the Fisheries Industry, Dairy Industry, Agriculture, Animal Husbandry; conventions of such groups as desire a dignified, pleasant and recreational background (Kiel is still a great summer resort) for their annual conventions. Third: That all provincial exhibitions and conventions be held at Kiel, where the modern hall affords all conveniences ready at hand and, therefore, the lowest costs to the meeting. Fourth: Contact is maintained with trade associations to demonstrate that such exhibitions are profitable in Kiel as "The Modern Apartment," "House, Health and Garden," "The Week-End." These shows bring together various interested but diversified industries. They are not single-trade shows.

The first year of the change, 1926, from a Nordic Fair to general exhibitions, developed nothing of importance. However, in 1927, there were several technical exhibitions of note, foremost among them, the "Fisheries Show," in connection with which a "Hunting and Shooting Show" (Jagdaustellung); a hygiene show called "Man." In connection with an "Office Show" was also an exhibition of savings banks and communal banks. There were the VI. Provincial Dairy Exhibition; the Northern Radio Show; the Sport Show; a Photographic Show; a Hair Dressing Show; an "Hotel and Inn Show," and others.

The fair, exhibition and convention activity of Kiel has been an important factor in building up new trade and shipping connections for the port.

Photo by] [Author.
Another View of the Retaining Wall.

KIEL AND CHARLESTON.

The writer must confess more than passing interest in the effort being made by Kiel. This interest comes from the striking parallel of the activities of Kiel and Charleston to develop their ports by public efforts. This naturally arouses a strong fellow feeling for the port promoters of Kiel. The municipal efforts of both ports are parallel both as to the fundamental situation and the methods used.

Charleston, once a great commercial port, was ruined by the war between the States (the Civil War—the War of Secession), 1860-1865, and the aftermath of that war. It left Charleston cut off by prohibitory rail rates and minority political affiliations from the remainder of the country. The reviving of the Port of Charleston during the World War was due to the Federal Government's Navy base, the Navy Yard for the Sixth Naval District, and to the Army Supply Base, constructed to serve what is now the Fourth Army Corps area of the south-eastern training and supply district of the United States. After the Armistice, the military and naval population departed. The great naval workshops and construction ways were empty, many stores on King Street, the retail district, that had catered to Army and Navy people, gradually disappeared. The foreign commerce of the port in 1922 was barely twelve million dollars. It was then that the City of Charleston realised that it could not base its prosperity upon federal fleets and military camps, but upon its own efforts in developing maritime commerce and industries. The city began to lift itself commercially by its own bootstraps. It purchased from the railroads and leased from the Government waterfront facilities. It established the Port Utilities Commission to develop these terminal facilities. It established the Charleston Traffic Bureau to remove rail and ocean rate discriminations. It established the Bureau of Port Development to sell the port to the shipping and ship operating public by bringing to the attention of shipper and carrier the advantages of the port and its facilities. The Bureau solicits new shipping companies and induces new ship lines to call regularly at the port. The methods used in these publicity efforts at Kiel and Charleston are strikingly similar. With the determined efforts of the municipality and the individual waterfront interests, the Port of Charleston rose from 34th port in 1922 to 14th port in 1927 among the 72 listed ports of the United States Shipping Board, based on the volume of tonnage of cargo handled in foreign trade through the port. Deducting two bulk cargo ports on the Great Lakes, it is now 12th port. Although the geographic situation of Charleston is less striking than that of Kiel at the Baltic entrance of the Kiel Canal, the methods of pointing out the savings to be enjoyed by using the port, in harbour and port charges, sailing distances, inland rail rates, quick turn around of vessels due to improved terminal facilities, etc., have been almost identical at the two ports. The results obtained show in both cases that with determined municipal efforts in port development, *it can be done*. The above discussion of the problems of the people of Kiel and their solution, may, at times, have had an ex parte flavour. One is enthusiastic in seeing one's own ideas as developed at Charleston applied quite independently and spontaneously at Kiel and with the same success.

New Type of "Globe" Foot Valve.

Interesting for dock and harbour work is a new and improved design of "Globe" foot valve for suction pipes, which is supplied in a number of standard sizes, constituting a freely opening unit with a large waterway, offering a minimum resistance to flow, whilst at the same time reducing to a material degree any tendency to slam when closing. The design is specially suitable for operation with centrifugal pumps, now so largely employed in general practice, and the construction is of a robust character, including a cast iron dome, valve plate and grating, with a leather ring flap, wrought iron valve plate, bolted to the leather with two bolts, and a reinforcing plate. Leather joints are provided on the machined faces, and a further improvement is represented by a D-shaped orifice, eccentrically arranged in the valve plate, so as to reduce to the least degree the amount of stagnant water space behind the valve hinge. In this way the greater part of the dome area is available for flow, giving very effective results both as regards the nett passage area and the directness of the flow, as compared with the ordinary shape of valve having a central orifice.

Further, it may be mentioned that the sizes of the grating have been determined with special reference to centrifugal pump practice, so that any solid material that might pass through the strainer will also be taken quite easily by the ordinary commercial size of centrifugal pump. As an example of the clear area of the waterway through this type of "Globe" foot valve, which is a production of Messrs. Glenfield and Kennedy, Ltd., of Kilmarnock, Scotland, the 4-in. size, when open to its full normal position, has an area through the pipe of 12.56 square inches, the strainer 37.6 square inches, and the valve plate 15.6 square inches, with 18 square inches round the flap. The figures are obviously very liberal, and a further valuable feature of the design is the addition, when required, of a flushing lever, which is used to raise the flap when any solid material has become jammed underneath it, and also for draining off the water during periods of frost.

Madras Port Trust.

Administration Report for 1927-28.

I.—GENERAL.

GENERAL.

The large increase in the revenue of the port, in the tonnage of cargo landed at and shipped from this port and in the number and tonnage of vessels that arrived at this port indicates that the trade outlook is improving from the temporary set-back experienced last year owing to industrial troubles and the coal strike in England and that further expansion can confidently be looked for in the future. The port may congratulate itself on having passed through a prosperous year on account of bumper crops due to timely rains.

VALUE OF TRADE.

The total value of the trade of the port amounted to 4,772.7 lakhs of rupees which represented 46.18 per cent. of the aggregate trade of the Presidency as against 46.41 per cent. in the previous year. Imports accounted for 2,527.43 lakhs and exports for 2,245.27 lakhs. These figures as to value are exclusive of Government transactions.

AUDIT FEES.

In accordance with the decision of the Government of India, dated the 15th of January, 1925, fees for the audit of the Madras Port Trust accounts (capital and revenue combined) based at the rate of Rs. .8 for Rs. 1,000 of receipts and charges were paid for 1926-27. Government of India have now decided that the Madras Port Trust should pay from 1927-28 Rs. 13,000 per annum instead of at the above rate, being the actual cost of the audit.

RECEIPTS.

The actual receipts including the contribution of Rs. 40,000 made by the Madras Port Fund amounted to Rs. 45,04,712, the largest in the history of the port and an increase of Rs. 7,65,349 or 20.5 per cent. over 1926-7, the previous best year. This abnormal increase in the revenue is due to the increase in the tonnage of both imports and exports landed at and shipped from this port. The main items which contributed towards the increase are:—Dues on imports +3,30,385, dues on exports + 1,65,521, harbour terminal charges +23,418, cranage +44,942, porterage special +86,646, quay dues +83,767, overtime fees + 40,370, water sold to boats +28,613 and contribution from Port Fund +10,000. Against these increases there have been the following decreases:—Interest on investments —29,362 and profit on investments — 13,824. The increases noticed under overtime fees and water sold to boats are due to the large increase in the number of vessels that arrived at this port during the year. The increases noticed under the other heads are all due to the large increase in the tonnage of imports and exports landed at and shipped from this port. The decreases under interest and profit on investments are due to the redemption of the 6 per cent. war bonds of 1927 matured on the 1st October, 1927.

EXPENDITURE.

The increase in the expenditure during the year when compared with the previous year amounted to Rs. 16,62,473 and is mainly due to Rs. 16,50,000 transferred to Capital. Referring to the detailed accounts, the increase noticed against direction is due to the absence of the chairman on leave. The saving noticed against stationery and printing is due to the major portion of the Trust's requirements having been obtained during 1926-27 and that against electrics is due to the fact that a number of sheds and buildings had to be completely rewired in view of the change-over which in turn eliminated heavy repair and maintenance charges. The increase against office contingencies is due to the payment of safe custody commission on the 6 per cent. 1927 bonds for Rs. 11,15,000 withdrawn for redemption and to the payment of audit fees for 1926-27 and that against rents, rates and taxes is due to the payment of property tax for 1926-27 found due after closing the accounts for that year and also to the payment of the educational tax for 1925-26 and 1926-27. Expansion of trade both in imports and exports accounts for the increased payment to labour. There was an increase of Rs. 3,21,142 in the expenditure under "Engineering and maintenance" made up of (1) Rs. 73,595 under sheds and buildings due to the renewal of the roof of transit shed No. IV. with corrugated asbestos sheets; (2) Rs. 76,691 under tracks due to the renewal of a considerable mileage of track laid about 14 years ago; (3) Rs. 64,981 under water due to the enhanced cost payable to the Corporation for water supplied to shipping, to the increased quantity of water supplied to shipping and to the adjustment made during the year of the cost of water supplied in the previous year; (4) Rs. 36,960 under crane power due to the working of electric cranes and of hydraulic cranes for longer hours to meet traffic requirements with the resultant increase of labour charges and to larger consumption of coal by steam cranes and of fuel oil in the power house; (5) Rs. 11,884 under dredging due to the dredger being required to work on maintenance dredging for a greater part of the year and the consequent reduced credit on account of capital dredging; and (6) Rs. 11,487 under loco working due to the working of locomotives for longer hours to meet traffic requirements. The saving under loss on investments is due to the reinvestment in the previous year in the 5 per cent. war loan of 1929/47 of the proceeds of the 6 per cent. 1926 bonds to the face value of Rs. 19,12,600 of the Capital account redeemed on the 15th September, 1926, and the increase under sinking fund is due to the raising of the amount to be contributed to the fund by Revenue under instructions from the Accountant-General. The saving under interest is due to the reduction in the rate of interest on the seven lakhs Provincial loan and to the gradual reduction of interest on other loans, and that under police is due to the payment in 1926-27 of the amounts due for 1925-26 and 1926-27.

WORKING EXPENSES.

The gross expenditure out of revenue inclusive of interest on capital, amortization of debt and contributions to capital came to Rs. 49,69,147 as compared with Rs. 33,06,674 in 1926-27 or to the equivalent of 110.3 per cent. of the gross receipts, the corresponding percentage in 1926-27 being 89.2. Excluding from the working expenses the interest on loans which in the year under review amounted to Rs. 8,44,081, contributions to capital, payment of debt and sinking funds and omitting from the receipts Rs. 40,000 contributions made by the Madras Port Fund, the actual working expenses came to 53.7 per cent. of the regular harbour earnings against 56 per cent. in the preceding year. The net result of working for the year has been a deficit of Rs. 4,64,435 due to a contribution of Rs. 16,50,000 to Capital as compared with a surplus of Rs. 4,32,690 in the previous year.

SHIPPING.

The number of vessels that entered the harbour has increased from 795 in 1926-27 to 936 in 1927-28 and the total net registered tonnage from 2,609,935 to 3,013,109 respectively, the figure for the current year both in the number of vessels as well as their aggregate tonnage being the largest in the history of the port. The average size or tonnage of each vessel has decreased from 3,573 net registered tons to 3,564 net registered tons. The total number of vessels that entered the harbour during the past four years was 674, 717, 795 and 936 and the number of vessels berthed at quays during the same period was 457, 540, 599 and 680 respectively. The number of 'Quay Days' or the number of days vessels were occupying the quays for the past four years has been 1,505 days in 1924-25, 1,810 days in 1925-26, 1,729 days in 1926-27 and 1,954 days in 1927-28. The vessel of the greatest tonnage which entered the port was the s.s. "Macharda," of Liverpool, with 9,785 tons gross and 6,209 tons net register and the vessel with the deepest draught was the ss. "Chantilly" drawing 29-ft. 6-in. Passengers to the number of 98,728 arrived at and 133,628 left the port, making a total of 232,356 against 225,391 during last year and 174,671 in 1925-26.

SINKING FUND.

A sum of Rs. 78,453 was contributed during the year towards the Sinking Fund for repaying the sterling loan of £330,000 raised in the London market in 1923 and this amount, together with the interest realised during the year on the Government securities purchased from the contributions of previous years, was invested in the 3½ per cent. Government securities. The total amount of the Government securities that stood to the credit of the Sinking Fund at the end of the year under review was Rs. 4,77,000.

OUTSTANDING LOAN.

The outstanding amount of loans due to the Secretary of State for India in Council was Rs. 1,35,09,354 at the close of the year under review.

II.—TRAFFIC IMPORTS.

IMPORTS AND EXPORTS.

The total tonnage of imports and exports during the year under review amounted to 1,444,342 tons or an increase of 27.4 per cent. over the previous year, the tonnage for the previous three years being 1,133,412 in 1926-27, 1,159,834 in 1925-26 and 1,117,221 in 1924-25. The year under review is a record one for this port as regards the total tonnage of both imports and exports landed at and shipped from this port. The total tonnage of imports during the year amounted to 1,047,654 or an increase of 24.1 per cent. over the previous year. The chief items which contributed towards the increase are coal + 37,365, tanning substances +3,822, rice +54,744, other food-grains +14,508, hardware +5,142, manures +10,697, kerosene oil +20,084, liquid fuel +11,163, benzine +7,842, Railway plant and rolling-stock +69,802, timber other than teak and jarrah +3,696 and Government stores +2,841. Decreases have also been noticed against cement — 6,168, chemicals — 3,537, paper and stationery — 2,599, sugar — 6,076, teak — 2,854, Australian timber — 21,987. Shipments during the year

amounted to 396,688 tons or an increase of 37 per cent. over the previous year. The main items which contributed towards the increase are onions + 4,587, hides and skins tanned + 5,412, scrap iron +2,612 and groundnuts +103,315. Decreases on the other hand were noticed chiefly against oil-cakes —1,221, ores — 1,989, and castor-seed — 3,466. The difference between the total traffic and the quantity sea-borne consisted chiefly of rail-borne coal which amounted to 4,304 tons against 1,407 tons of the previous year, coke 1,406 tons against 1,215 tons of the previous year and timber 85 tons against 200 tons of the previous year. The above figures do not include 5,400 tons of railway-owned coal brought in for transhipment from broad to metre gauge. Full details of the trade variations in some of the chief commodities dealt with in the harbour during the year under review as compared with the previous year are detailed in the paragraphs below.

COAL.

Coal imported during the year amounted to 283,604 tons or 27 per cent. of the total import trade or an increase of 15 per cent. over the previous year. The increase is due to increased facilities in the number of vessels available for this traffic and to cheap freight. There were no imports of foreign coal during the year and the imports of Bengal coal have increased from 244,832 tons to 279,300 tons. Of the entire quantity imported 4,304 tons came by rail and the rest by sea and the major portion of the coal imported was loaded into wagons at the east quay direct from the vessels, ensuring quick despatch and the minimum of transhipment losses. The tonnage of coal booked from the harbour by rail amounted to 229,934 tons in 1927—28 against 198,487 tons in 1926—27 and 245,143 tons in 1925—26. Details of coal transactions for the past seven years are given below, under Table A.

COKE.

Imports of this commodity increased by 55.46 per cent., the figure for the current year being 3,588 tons.

OILS.

The imports of kerosene oil representing 43.3 per cent. of all mineral oils imported advanced by 35.86 per cent., the figure for the current year being 76,093. Of this quantity Burma contributed 41,022 tons or an increase of 7 per cent. over previous year's imports. The imports of foreign oil consists of 8,947 tons from America, 18,508 tons from Singapore, 2,959 tons from Bal (Java) and 4,074 tons from Abadan (Persian Gulf). Imports of case oil have fallen by 49 per cent., the figure for the current year being 849 tons. Imports of fuel oil (liquid fuel) increased by 22 per cent., the figure for the current year being 61,532 tons. Out of this quantity 44,718 tons came from Abadan (Persian Gulf), 10,250 from the Straits Settlements and 6,564 tons from Calcutta. The large increase is due to heavier bunkering in oil-burning vessels and to its increasing use for agricultural and industrial purposes in place of coal. Imports of benzine (petrol) advanced by 34.3 per cent., the figures for the current year being 30,699 tons, due to the heavy motor traffic both at Madras as well as in the interior. The entire quantity of benzine imported into this port came from Burma. Imports of lubricating and other mineral oils increased by 15 per cent., the figures for the current year being 7,460 tons. Imports of vegetable oils decreased by 45.8 per cent., the figure for the current year being 1,009.

MANURES OTHER THAN BONE.

There was a large increase in the imports of chemical manures at this port, the figure for the current year being 11,225 tons against 528 tons of the previous year. The increase is due to Government encouragement of the use of manures and considerable sums spent in fertiliser propaganda by the agents of large chemical interests in the United Kingdom.

METALS.

The imports under this head have increased from 82,842 tons in 1926—27 to 85,734 tons in 1927—28, the largest on record, and an increase of 3.5 per cent. over the previous year's figure. The importation of iron and steel handled by the Trust increased by 16 per cent., the figure for the current year being 29,510 tons, while those not handled by the Trust fell by 4.5 per cent., the figure for the current year being 44,453 tons. The increase under iron and steel handled by the Trust is due to the harbour works at Cochin and Vizagapatam and to the irrigation schemes on hand in the Presidency. The chief competitors for the supply of raw iron and steel are the United Kingdom and Belgium, the United Kingdom taking the first place in spite of keen competition from Belgium. The importation of tin and tin-plates showed an increase of 38.2 per cent. over the previous year, the figure for the current year being 3,916 tons. The importation of other metals also showed an advance of 36 per cent. over the previous year, the figure for the year being 4,680 tons. The imports of iron and steel and tin-plates during the past seven years are shown below in Table B.

RICE AND FOOD-GRAINS.

The imports of rice during the current year have increased by 132.7 per cent., the figure for the current year being 96,011 tons. Of the total quantity Rangoon contributed 62,925 tons, Straits Settlements 17,634 tons, Haiphong 4,606, Bassein 3,720, Bangkok 3,444 Akyab 1,484, Saigon 1,018, and other ports 280. The imports of other food-grains also showed an advance of 50.8 per cent., the figure for the current year being 43,045 tons. The large increase in rice and food-grains is due to the want of timely and sufficient rains in certain districts, to the disastrous cyclone that swept over Nellore and to the diversion of the traffic to India on account of the disturbed state of China.

TIMBER.

Imports of teak from Burma showed a fall of 10.75 per cent. when compared with the previous year, the figure for the current year being 23,680 tons. The imports of Australian timber (Jarrah sleepers for railways) have fallen considerably during the year, the large increase in the previous year being due to the construction of new lines and heavy sleeper renewals. Imports of other timber including firewood and shooks, have increased by 84 per cent., the figure for the current year being 8,093 tons. Firewood imported by country craft has advanced by 163.6 per cent., the figure for the current year being 5,730 tons, and tea shooks from the United Kingdom have also increased by 12 per cent., the figure for the current year being 1,616 tons.

MOTOR CARS, MOTOR CYCLES AND CYCLES, ORDINARY.

The number of motor cars and 'buses imported during the year constitutes a record for the port, and exceeds the previous best year by 878 cars, or an increase of 34 per cent., the figure for the current year being 3,471 cars against 2,593 cars in 1926—27. Of this number, more than 50 per cent. came from America. The increase is due to keen competition and fall in prices. There was a large increase in the importation of motor cycles during the year under review of 73.5 per cent., the figure for the current year being 545 against 314 of the previous year. Practically the whole of this number came from the United Kingdom. The importation of ordinary cycles also increased by 24.6 per cent., the figure for the current year being 3,250 tons (measurement) against 2,608 tons (measure-

TABLE A.

—	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	1921-22
	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.
Imports by rail	4,304	1,407	4,406	3,118	21,127	531	3,535
Imports by sea	279,300	244,832	285,652	284,784	267,547	253,505	260,033
The quantity put into ships' bunkers...	24,964	27,930	25,357	24,036	28,551	29,981	39,457
Railway coal transhipped from broad to metre guage wagons in the harbour...	5,400	1,690	5,833	3,127	21,205	214	908

TABLE B.

—	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	1921-22
	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.
Iron and steel handled by the Trust	29,510	25,427	20,655	20,819	15,878	15,828	14,795
Iron and steel not handled by the Trust	44,453	46,566	32,710	37,675	34,883	45,883	24,648
Tin and tin-plates	3,916	2,834	4,858	4,934	4,694	6,448	2,156

ment) in 1926-27. Practically the whole of this tonnage came from the United Kingdom. Table C below will show the total imports under the above heads for the past eight years.

RAILWAY PLANT AND ROLLING STOCK.

The imports under this head have increased from 27,026 tons to 96,828 tons—the largest on record in the history of this port and is better than the previous best year, viz., 1922—23 by 44.7 per cent. The bulk of these materials came from the United Kingdom. The increase is due to the importation by the two neighbouring railways of very large materials for the construction of new railway lines and for the extension of the workshops at Perambur and Golden Rock. The increase consisted mainly of carriages and locomotive engines and parts thereof ordered for delivery during 1926—27, but received only during 1927-28, owing to the coal strike in England in 1926-27 and also of sleepers and keys of steel or iron in consequence of the heavy programme of works on hand.

PROVISIONS AND OILMAN STORES.

The imports under this head showed an increase of 8 per cent. over the previous year, the figure for the current year being 7,104 tons.

TEXTILES.

The imports of raw cotton have advanced by 56.28 per cent., the figure for the current year being 2,513 tons. Imports of twist and yarn have also increased by 10 per cent., the figure for the current year being 6,218 tons. Imports of piece goods fell by 12.6 per cent. when compared with the previous year, the figure for the current year being 6,551 tons. The fall is due to over stock in the market, continuous decline in prices, unfavourable agricultural conditions and competition with Indian-made stuff. Imports of gunnies showed an increase of 33 per cent. over the previous year, due to the unusually heavy ground nut traffic that passed through the port. The imports under other textiles increased by 24.5 per cent., the figure for the current year being 3,070 tons.

SUGAR AND JAGGERY.

The imports of sugar fell by 12.6 per cent., the figure for the current year being 25,276 tons against 28,928 tons of the previous year. The fall is due to heavy stock in the market and to the drop in the price. The imports of molasses from Java for the Nellikuppam and Samalkot factories for distillery purposes fell from 4,353 tons to 1,929 tons.

CEMENT.

Imports of cement showed a further fall, the figure for the current year being 11,834 tons against 18,002 tons of the previous year, or a fall of 34.26 per cent. The fall is presumably due to increased production of cement by Indian manufacturers of good quality at cheaper rates.

CHEMICALS.

Imports of chemicals showed a fall of 27.5 per cent., the figure for the current year being 9,388 tons.

HIDES AND SKINS (RAW).

The imports of this commodity from Ceylon and the Straits Settlements have fallen by 30 per cent., the figure for the current year being 2,917.

HARDWARE.

There has been an increase of 55 per cent. in the imports of this commodity, the figure for the current year being 14,502 tons, the largest on record, against 9,360 tons during the previous year.

MATCHES.

Imports of matches during the year under review reached the record figure of 7,113 tons by measurement, or an increase of 19 per cent. over the previous year. The increase is due to heavy imports from Burma.

GLASSWARE.

The imports of this commodity have not shown any change, the figure for the current year being 16,194 tons.

MACHINERY.

The imports of this commodity have advanced by 14 per cent. over the previous year, the tonnage for the current year being 12,508 tons, the largest on record. Ninety-two per cent. of the total imports came from Europe.

PAPER AND STATIONERY.

The imports of these commodities fell by 13.8 per cent., the figure for the current year being 16,256 tons by measurement. The fall under this head is mainly due to printing paper, whose imports have been curtailed on account of overstocking in the previous year.

TANNING SUBSTANCES.

The imports of tanning substances increased by 61.44 per cent., the figure for the current year being 10,043 tons. Ninety per cent. of this commodity, amounting to 9,051 tons, consisted of whattle bark imported from Natal for tanning hides against 5,878 tons of the previous year. The marked increase noticed is due to the growing prosperity of the tanned hides trade, for which it is used, and to its being less expensive than avaram bark, which cannot be obtained in large quantities.

LIQUORS.

The imports under this head showed an increase of 26.5 per cent. over the previous year, the figure for the current year being 5,350 tons. Ale, beer and porter formed over 60 per cent. of the total imports of liquor.

MISCELLANEOUS.

Imports of Government stores increased by 41 per cent.; tobacco (manufactured) by 47.6 per cent.; and fodder by 33 per cent. On the other hand, building materials other than cement fell by 12.5 per cent.; soap by 6 per cent.; spices by 37 per cent.; tobacco (unmanufactured) by 29.1 per cent.

EXPORTS.

GROUNDNUTS.

The tonnage of this most important staple article, which was shipped from this port during the year under review on a larger scale than any other single produce, forming 67.26 per cent. of the total exports of the port, amounted to 266,834 tons, or an increase of 63.2 per cent. over the previous year. The shipment of this commodity during this year constitutes a record for the port. For want of freight at the close of the year to meet the large demand, larger shipments could not have been made during the year, with the result that large stocks remained in the harbour as unshipped at the close of the year. The large increase is due to greater demand owing to revival of normal trade conditions in Europe, to increased yield of the crop and to greater facilities in securing freights to continental parts. The exporters took advantage of the favourable market and easier freights and disposed of their stock of 1926-27. Europe took 97 per cent. of the total quantity shipped or an increase of 69.34 per cent. over the previous year's shipments. Exports coastwise have fallen by 34.5 per cent. Trade with Singapore showed a revival, the shipment for the year being 1,169 tons. The shipment of the traffic during the past seven years is shown below in Table D.

VEGETABLE OIL.

The shipment of this commodity, consisting mainly of coconut and groundnut oils, showed no signs of improvement, the figure for the year under review being 3,185 tons against 3,175 tons of the previous year.

OIL-CAKES.

There was a fall of 38.2 per cent. in the shipment to Ceylon of this commodity, consisting of sesamum cake and groundnut cake, the figure for the current year being 1,975 tons.

TABLE C.

—	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	1921-22	1920-21
Motor cars, vans, buses, lorries, No.	3,471	2,593	2,387	1,292	1,190	927	406	1,971
Motor cycles, No.	545	314	292	200	107	119	79	641
Plain cycles, Tons	3,250	2,608	1,904	1,395	1,014	949	707	2,520

TABLE D.

—	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	1921-22
	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.
Shipments to Europe	258,570	152,688	158,444	138,352	81,875	92,039	119,038
Shipments to Singapore	1,169	—	—	—	1	—	17
Shipments to Coast ports ...	7,095	10,831	4,704	9,852	4,120	2,222	10,400
Total	266,834	163,519	163,148	148,204	85,996	94,261	129,455

ORES.

There was a further fall of 12.3 per cent. in the shipment of this commodity, the figure for the current year being 14,195 tons against 16,184 tons of the previous year. Table E below shows the shipment of the several kinds of ores during the past seven years.

COTTON.

The shipment of this commodity, which is the second most important staple article of the export trade of the port, has fallen from 16,472 tons to 15,622 tons, due to less demand from Japan on account of her financial troubles, and from China on account of her internal troubles. The major portion went to Belgium and Japan.

TOBACCO.

The shipment of raw tobacco fell by 10.2 per cent., the figure for the current year being 6,583 tons by measurement. Sixty-one per cent. went to the United Kingdom, and the rest to the Straits Settlements and the Federated Malay States. Shipments of manufactured tobacco also declined by 12.4 per cent., the figure for the current year being 3,837 tons by measurement.

ONIONS AND OTHER VEGETABLES.

The shipment of onions from this port to Rangoon, Ceylon, the Straits Settlements and the Federated Malay States has reached a record figure, the figure for the current year being 21,305 tons, or an increase of 27.4 per cent. over the previous year. Shipments of other fruits and vegetables consisted mostly of mangoes, which amounted to 137,629 baskets during the year. The major portion went to Rangoon.

HIDES AND SKINS.

The export of raw hides and skins from this port declined by 8 per cent., the figures for the current year being 1,280 tons. Exports of tanned hides and skins, on the other hand, advanced by 34.2 per cent., the figure for the current year being 21,245 tons. The greater part of this quantity went to the United Kingdom. The increase is due to improved demand from the United Kingdom and the United States of America, and also to the former country's better trade prospects with the latter.

BUNKERS.

During the year under review 24,964 tons of coal and 31,811 tons of liquid fuel were shipped from this port for bunkers as compared with 27,930 tons and 23,225 tons in 1926-27 and 25,357 tons and 15,968 tons respectively in 1925-26.

TEA.

There was not much improvement in the shipment of this commodity during the year, the figures for the past five years being 1,382 tons, 2,300 tons, 2,675 tons, 3,062 tons, and 2,907 tons respectively.

MANURES.

The shipment of bone manure during the year has doubled itself, the figures for the current year being 1,287 tons. Shipments of other manures, including acetate of lime, have fallen by 23.4 per cent., the figure for the year being 2,812. The shipment of acetate of lime from this port showed signs of revival, the figure for the current year being 1,189 tons against 612 tons of the previous year.

SCRAP IRON.

There are signs that the shipment of this commodity from this port will develop in the future. The figures for the past four years are given below:—

—	1927-28	1926-27	1925-26	1924-25
	TONS.	TONS.	TONS.	TONS.
Scrap iron	2,885	500	725	1,337
Pig and hoop iron	1,034	801	1,916	1,962
Iron sleepers	Nil	—	1,001	1,531

PIECEGOODS.

There was a slight increase in the shipment of piecegoods to the Straits Settlements, Ceylon, Java, the Federated Malay States and Africa, consisting mainly of coloured piecegoods such as sarees, lunghies, Madras cloth and Madras handkerchiefs, the figure for the current year being 6,084 tons against 5,209 tons of the previous year. The shipment of Madras handkerchiefs—a speciality of Madras and an industry giving employment to thousands of small capitalists and traders and poor workmen—showed an expansion. Most of this stuff went to the United Kingdom for reshipment to the African markets.

PROVISIONS.

The shipment under this head, consisting of ghee, pickles, condiments, dry mutton, etc., mostly to the Straits Settlements and Ceylon, showed a slight fall, the figure for the year being 6,431 against 6,961 tons of the previous year.

CASTOR AND OTHER SEEDS.

There were no shipments of castor and cotton seeds during the year, though 3,466 tons of the former and 738 tons of the latter were shipped in the previous year. Shipments of other seeds also declined from 1,083 tons to 372 tons.

III.—MATTERS OF GENERAL INTEREST.

SCALE OF RATES.

During the year the scale as well as the statement of services and conditions attached to such services have been amended with the sanction of Government four times, as enumerated below:—

(1) The rate for the supply of Corporation water to shipping has been raised from Rs.2 to Rs.2-8-0 per 500 gallons.

(2) A large number of amendments and additions to the scale as well as to the statement of services and conditions attached to such services were made in July, 1927. Besides the alterations in the scale itself, the amendments and additions related mainly to the clauses relating to (a) transit dues; (b) how dues are leviable; (c) overtime fees; (d) hire of cranes to masters of vessels; (e) quay dues; (f) vehicles, hawkers and angling licences and (g) tokens.

(3) The rate of harbour dues against scrap iron has been reduced from Rs.2-14-0 to Re.1 per ton.

(4) The rate of harbour dues against cows has been reduced from Rs.4 to Rs.2.

RAILWAY WORKING.

The railway traffic handled during the year under review amounted to 625,584 tons in 47,262 broad-gauge wagons inwards and outwards, and 244,458 tons in 34,904 metre gauge wagons inwards and outwards, aggregating in all 870,042 tons. The harbour terminals and the freight collected on behalf of the two connected railways on the above traffic for the past four years are given in Table F below.

GENERAL.

Electric cranes.—One 5-ton and four 3-ton electric portal cranes which were erected to facilitate the handling of cargo direct from vessels' holds at west quay berths Nos. 1 and 2, were brought into use in April, 1927. The 5-ton crane on the south groyne was also brought into use in June, 1927.

Fully erected locomotives.—The m.v. "Beldis," specially constructed to carry locomotives fully fitted up, arrived here on the 30th September, 1927, and landed at the east quay five broad-gauge locomotives for the South Indian Railway. The locomotives with tenders attached weighed 65 tons 8 cwt. and 3 qrs. each, and were discharged by the ship's 100-ton derricks on to a railway track 10-ft. away from the edge of the quay. This is the first instance in the annals of the port when fully erected locomotives were landed. A further consignment of 19 locomotives for the South Indian Railway arrived by the m.v. "Belray" on the 19th December, 1927.

TABLE E.

—	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	1921-22
	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.	TONS.
Manganese	—	—	—	5	3,012	—	—
Magnesite	10,315	11,184	12,815	11,478	7,671	9,142	9,949
Chrome ore	3,880	5,000	12,621	11,506	10,396	26,439	1,501
Total	14,195	16,184	25,436	22,989	21,079	35,581	11,450

TABLE F.

—	1927-28		1926-27		1925-26		1924-25	
	Madras and Southern Mahratta Railway.	South Indian Railway.	Madras and Southern Mahratta Railway.	South Indian Railway.	Madras and Southern Mahratta Railway.	South Indian Railway.	Madras and Southern Mahratta Railway.	South Indian Railway.
Tonnage	625,584	244,458	457,313	195,633	527,846	184,617	458,368	190,920
Freight, Rs.	48,22,695	9,98,784	32,75,921	7,87,111	35,51,994	6,81,119	32,53,006	5,95,577
Harbour terminals, Rs.	2,72,776	1,17,876	2,15,395	93,832	2,29,202	80,895	2,24,289	83,715

Best use of quays.—As an evidence of the rapidity with which cargo may be handled at the port, the following record is given. On the 5th February, 1928, the " s.s. City of Evansville " discharged 2,332 tons of cargo on to the quay at an average rate of 123 tons per hour. The cargo consisted of barrels, drums, motor-cars and machinery parts.

IV.—ENGINEERING.

New deep water quay—estimate Rs.12,00,000.—During the year under review, 259 piles were manufactured, thus bringing up the total of piles manufactured up to date to 430. Of these, 224 piles were sunk during the year. A length of 162-ft. of the concrete superstructure of the quay has been completed and a short length of the granite sett roadway has been laid.

Construction of a new breakwater from the south-east corner of the harbour—estimate Rs.9,00,000.—Mass concrete capping was completed up to a further length of 329-ft. 6-in., thus leaving only 150-ft. 6-in. to be finished. Work on this was stopped by the end of October, 1927, to see if any settlement would occur at the east end during the cyclone season. There was a slight settlement at the extreme end during the cyclone in the first week of November, 1927. No damage was caused to the capped portion. Further work on this was started at the end of March, and it is expected that the mass concrete portion will be finished within the next official year.

Electric equipment for cranes and crane tracks, etc.—estimate Rs.8,04,000.—Both the sub-stations have been brought into use and all the electric cranes—five at west quay and one at south groyne—are now working. These new electric cranes handle cargo very quickly and are working very satisfactorily. The change over from direct current to alternate current has considerably reduced the cost of current supplied to the Port Trust.

Provision of additional warehouse accommodation on the south accretion—estimate Rs. 4,00,000.—Good progress has been made during the year under review in the construction of the warehouses on the reclaimed area. These sheds have been built with wedged stone from the Trust's quarries at Pallavaram, laid in lime mortar and pointed both sides with cement mortar. The stone masonry has proved to be slightly cheaper than brickwork and will, of course, be much cheaper to maintain in future years. The smaller shed was expected to be completed and ready for use by the end of July, 1928, and the bigger one should be ready by the end of October, 1928. It is hoped that these two new warehouses will considerably relieve the congestion now being felt for the storage of groundnuts, tanned skins and hides and other important articles.

Improvements to Springhaven shed and its environs—estimate Rs. 1,76,000.—This work, which was commenced by the middle of 1926, was expected to be ready by the end of June, 1928. The delay in completion was largely due to the very late delivery of the steelwork by the contractor on account of the strike in England during the latter part of 1926 and an accident to the steamer which was conveying the steelwork from England.

Construction of a new store shed on the south accretion—estimate Rs.1,35,000.—This work, which was commenced in October, 1926, was completed during the year under review, being brought into use early in October, 1927.

Repairs to cyclone damages: provision of additional wave-breaker protection to the outer breakwater—estimate Rs. 1,15,000.—During the monsoon season in November, 1927, considerable damage was caused to the outer breakwater, where a settlement of the wavebreaker blocks between the sheltering arm and the east quay took place, the breakwater capping being damaged in several places. Capping blocks weighing as much as three or four tons each were torn up and thrown on to the top of the breakwater, ripping up the titan lines. For providing additional protection to the breakwater and making other sundry repairs, an estimate amounting to Rs.1,15,000 has been sanctioned, and the work of making new wavebreaker blocks and depositing them is well on hand.

Cooum pumping scheme.—In order to relieve the insanitary condition of the Cooum, a scheme has been sanctioned by the Government to instal two centrifugal pumping sets inside the timber pond limits of the Port Trust for pumping sea water into the Cooum. The Port Trust are erecting the pump-house and installing the pumping sets. It was expected that the work inside the harbour would be completed by the end of July, 1928.

Dredging.—(a) The suction dredger " Madras " worked for 241 days during the year, of which 204½ days were spent in maintenance dredging and the remaining days in capital dredging in deepening the harbour to 32-ft. and on other works. The lower average daily tonnage is due to the increased traffic in the harbour which made the work of maintaining the depth of the berths much more difficult than formerly, and also to the fact that much of the capital dredging is now completed.

(b) Dredging statistics.—The table below gives the quantity dredged during the year and progressive totals:—

Particulars	Unit	Dredger " Madras " 1927-1928	Dredger " Madras " 1906 to 1928
Quantity dredged	Tons	154,780	4,462,266
Working days—			
(a) Dredging	No.	241*	4,390½
(b) Other works	,,	—	153
Sundays and holidays	,,	51	1,113
Days absent to overhaul and special repairs	,,	25	1,491
Days under repair and weather bound ...	,,	49	888½
Dredged per working day	Tons	642¼	1,016¾
Rate per ton	Annas	14.7717	8.8872
Rate per ton including interest and depreciation	,,	19.1975	12.2665

* For maintenance 204½. For other works 36⅝.

V.—POLICE AND MEDICAL.

The following is a summary of the reports received from the Police and the Medical authorities:—

(a) Police.—The value of the property stolen from the harbour premises has decreased from Rs.627-10-0 to Rs.555 as compared with the previous year. The total number of cases reported during the year was 50, of which eleven were thefts of articles above Rs.5 in value, ten petty thefts below Rs.5, and the rest were under other sections of the City Police Act, etc. This compares with 60, 19 and 10 cases respectively in the previous year. Cases of theft in the harbour have been steadily decreasing year after year, owing to more effective supervision by the police officers at the gates and elsewhere in the harbour.

(b) Medical.—Eight hundred and eighteen vessels arrived here from different ports with crews numbering 75,748 and 115,166 passengers, against 716 vessels with crews numbering 73,599 and 90,023 passengers during the previous year. Three hundred and forty-two vessels with crews numbering 34,343 and 56,964 passengers were inspected and granted bills of health, against 286 vessels with crews numbering 29,751 and 78,327 passengers in the previous year. There were four cases of chicken-pox, five cases of smallpox, four cases of acute pneumonia, one suspicious case of cholera, one case of measles, five cases of influenza and one suspected case of bubonic plague on steamers that entered the harbour during the year and were sent to infectious diseases hospitals for treatment. The disinfection of bedding and clothing of deck passengers and crews landing at, and embarking from, the port was continued in the disinfection shed in charge of a sub-assistant surgeon. A nurse is employed for the examination of female passengers. No unusual mortality of rats was reported on any of the vessels that entered and left the harbour during the year. The Clayton disinfecting apparatus was maintained in the port.

VI.—MUNICIPAL TAXATION.

The total amount paid to the Corporation by the Port Trust as taxation during the year 1927-28 amounted to Rs.1,74,558. In addition, Rs.36,496 was paid for 29,200,891 gallons of Corporation water for the Trust's use and Rs.96,262 for 25,626,629 gallons of water supplied to shipping or at the respective rates of Re.1-4-0 and Rs.4 per 1,000 gallons.

VII.—MANAGEMENT.

(a) Port Trustees.—The number of ordinary meetings held during the year was 25, against 24 in the previous year, and the statutory special Budget meeting, as required by Section 82 of the Madras Port Trust Act, was held on the 20th January, 1928.

The committee appointed for the consideration of certain amendments to the Trust's Scale of Rates—referred to in paragraph 60 (a) of the last year's report—held three meetings in the year under review and submitted their report to the Board. The Board appointed a standing committee to consider and report to them their recommendations on such of the proposals which, in view of their nature, the chairman may wish from time to time to refer to the committee before submission to the Board. This committee held two meetings during the year to consider the following subjects referred to them by the chairman and made their recommendations thereon to the Board:—

(1) Alterations and additions to the Trust's Schedule of Staff.

(2) Introduction of a system of contributory Provident Fund coupled with long service gratuities in lieu of the existing system of pension for the benefit of the Port and the Pilotage Fund employees; and

(3) The scale of charges to be levied by the Trust for electrical energy supplied by it to others.

During the year the Board elected M.R.Ry. Diwan Bahadur Govindoss Chathoorboojadoss Garu and M.R.Ry. V. Venkateswara Sastrulu Garu to represent them on the Corporation of Madras and the Madras City and Suburban Town Planning Trust respectively.

The honour of Knighthood was conferred by Government on two of the members of the Board, viz., Messrs. A. A. Biggs and T. M. Ross.

The Board record with regret the death during the year of Sir Mackenzie Ross, Kt., a representative of the Madras Chamber of Commerce.

(b) Staff.—Sir Bradford Leslie, Kt., O.B.E., M.Inst.C.E., M.I.E.E., chairman and chief engineer, went on six months' leave from the 24th April, 1927, and Mr. A. A. Biggs, M.Inst.C.E., M.I.E. (Ind.) (now Sir Ashley Biggs), Agent of the Madras and Southern Mahratta Railway Company, Ltd., was appointed as chairman during this period, with Mr. W. Fyffe, deputy acting engineer, as acting chief engineer.

Commander P. C. H. Lane, R.I.M., Deputy Port Conservator, availed himself of the ninety days' privilege leave granted to him with effect from the 21st December, 1927, and subsequently extended it to nine months. Mr. A. MacKenzie, senior Harbour Master, officiates as Deputy Port Conservator pending the arrival of an officer of the Royal Indian Marine to take charge.

Mr. J. G. Lord, traffic manager, proceeded on eight months' leave with effect from the afternoon of the 28th March, 1928, after handing over charge temporarily to Mr. F. W. Stooke, first assistant traffic manager.

Mr. S. Narayana Ayyar, M.A., who was the recipient of the title of " Rao Bahadur " among the New Year honours, continued as chief accountant throughout the year.

Mr. T. W. Mair, mechanical engineer, proceeded home on the afternoon of the 5th November, 1927, on two years' leave preparatory to retirement, and Captain E. G. Bowers, of the Bombay Port Trust, succeeded him as mechanical and electrical engineer on the 1st January, 1928.

The Trustees desire to record an expression of their regret for the death by kalahazar in London, while on leave for six months, of Mr. C. G. S. Carolin, B.A., B.A.I., assistant mechanical and electrical engineer, a promising young officer.

Mr. S. W. White, M.Inst.M.E., assistant mechanical engineer, who was recommended by Messrs. Rendel, Palmer and Tritton, of Westminster, was appointed to succeed him with effect from the 12th August, 1927.

Mr. J. L. Pinto was office manager throughout the year.

Amenities for the staff.—During the year under review, a Co-operative Credit Society was formed for the Madras Port Trust employees, and registered under the Co-operative Societies Act by Government. The Society is making good progress.

Irish Harbour Matters.

DROGHEDA HARBOUR COMMISSIONERS.

The following eight members of the Drogheda Harbour Commission, who retired by rotation, have been re-elected:—Messrs. Thomas Berrill, L. Stanley, Robert Webster, J. Dowd, J. Berrill, Cecil Thornhill, Jas. McCarthy, Peter Lynch, Jnr., and Mr. Thos. J. Molloy in lieu of Mr. T. J. Byrne.

PROPOSED HARBOUR FOR BALLYCASTLE, COUNTY ANTRIM.

Ballycastle (Co. Antrim) Urban District Council has informed the Ministry of Commerce for Northern Ireland of its willingness to levy a rate of 1s. 3d. in the pound for a period of 50 years towards the cost of a commercial harbour at Ballycastle, amounting to about £50,000. It was also decided to accept Joint Control of the harbour with the Rural Council. At a meeting of the Urban Council held to consider the matter, the Chairman (Mr. W. H. Belford, J.P.) regarded the scheme as the chance of a lifetime for Ballycastle. It was possible, he said, that the Government and the County Council would help financially to the extent of half the cost.

FUTURE OF WICKLOW HARBOUR.

To make Wicklow Harbour what it should be would cost £40,000. This statement was made by Mr. J. H. McCarroll, solicitor, at a special meeting of the Wicklow Harbour Board, held to consider the payment of £310, amount of the award and costs in connection with an action against the Board by Mr. Curran, Kilkeel, Co. Down, whose son, a fisherman, lost his life at the port last year, plus their own cost in defending the action and appealing, giving a total of about £450. This year's income amounted to £284 with increased tolls as from May last. Current expenses amounted to £270.

Mr. McCarroll said that, as a business proposition, the Board should pay this debt. As at present the Board had no borrowing powers, he suggested approaching the Free State Minister for Local Government for permission to introduce a special Bill into the next session of the Dail, or for a Provisional Order. The Provisional Order would cost £70 or, if there was opposition, £180. They would have only their revenue as security. In the past, he said, £60,000 had been spent reconstructing the harbour. The consolidated loans of this would be paid off in 18½ years, but he did not know if the guaranteeing areas would agree to a further extension of borrowing powers to the Board.

In the alternative, if the Ports and Harbours Tribunal decided that Wicklow Harbour was one to be carried on, similar powers could be inserted in the Bill to be introduced, but there was a danger of the harbour being included amongst those to be abolished.

SOUTH AFRICAN MAIL BOATS BUILT IN BELFAST.

For the Union Castle Line, Messrs. Harland and Wolff, Ltd., are building at Belfast for the South African mail service, two 20,000 tons, twin-screw motor ships to be named Winchester Castle and Warwick Castle respectively. These vessels are substantially repeats of the Carnarvon Castle and will be launched in 1929.

LIMERICK HARBOUR REPORT. RECEIPTS INCREASED.

In the statement of accounts for the year 1927, issued by the Limerick Harbour Commissioners, Mr. John F. Power, Secretary, states that the number of vessels, excluding river craft, which entered the port during the year was 427, totalling 234,398 net register tons. This shows an increase over 1926 of 79 vessels and 36,692 net register tons. The revenue from dues, dock tonnage, imports, exports, quayage and lights amounted to £25,367 18s. 9d., an increase of £3,326 16s. 2d. The income amounted to £28,443 14s. 0d., an increase of £4,597 15s. 5d. Ordinary expenditure amounted to £13,926 3s. 1d.; £56 17s. 1d. less than last year, to which must be added capital expenditure, £1,011 7s. 10d. on dock extension and 1926 Act and £300 for Harbour launch, totalling £1,311 7s. 10d. There were no liabilities and the Commissioners have invested in Irish Free State 5 per cent. Loan, and War Loan 5 per cent., £29,507 6s. 8d., and a credit balance at the bank of £3,786 1s. 10d.

At the close of the year there were outstandings due to the Commissioners, £886 8s. 3d., all of which has been collected, except £10 due for way leave and £11 for repairs to Quay Road.

The outstanding liabilities of the Board have all been paid off.

Mr. T. F. O'Sullivan, Harbour Engineer, states that the wet dock gates were thoroughly overhauled and a concrete hut erected at the Pier Head at a cost of £1,172 15s. 4d. for the year. Seven vessels used the graving dock during the year, working expenses and maintenance amounting to £211 15s. 4d. All the river lights and buoys were kept in order at a cost of £1,011 11s. 2d. The cleansing, watering and repairing of roadways cost £1,045 4s. 0d., and it is pointed out that the present surface of the North and West Dock roadways is unsuited to the heavy traffic which now passes over them. The cost of maintaining floating and other plant amounted to £481 15s. 5d. A new boiler was fitted in the grabber and considerable dredging was carried out in the wet dock and quay berths. The newly purchased steam launch, " Firefly," proved invaluable in connection with the maintenance of the harbour.

PROPOSED DRY DOCK IN CORK HARBOUR.

During a discussion by the Cork Harbour Commissioners of Sir John Scott's proposal that a dry dock should be constructed in Cork Harbour, Sir James Long, General Manager, stated that in view of the Board's large commitments on works now in progress, the time was inopportune to embark on an undertaking the estimated cost of which was £11,265. The works now in progress should be completed before the Board entered on new undertakings.

Sir John Scott said that he had no desire to rush the question, but there could be no doubt that such a dock would be a credit to the Port of Cork and an asset to the Harbour Commissioners.

Mr. Wallace thought that the Board should have information as to what dry docks at present were lying idle in the harbour.

BELFAST SHIPBUILDING.

When the oil tank vessel of 600-ft. long and 18,000 tons gross is under construction at the yard of Messrs. Workman, Clark (1928), Ltd., Belfast, the Northern Ireland capital will have, with the 60,000 ton White Star liner which Messrs. Harland and Wolff are building, two of the largest vessels of their kind.

ERRATUM.

The return of foreign tonnage into the Port of Dublin for the six months ended 30th June, 1928, showed a total of 254,181 tons, not 25,181 tons as printed on page 332 of the September issue.

Mr. Bailey, Secretary of the Dublin Port and Docks Board in his evidence before the Irish Free State Ports and Harbours Tribunal stated that certain undeveloped lands within the harbour were let by the Board on lease for a term of 99 years. The last letting was made at a rent of £125 per acre. This was given as £25 in the report published in our August issue on page 304.

PORT FACILITIES AND CHARGES AT MEMEL, LITHUANIA.

The Department of Overseas Trade has received from the British Vice-Consul at Memel a report giving full particulars as to port facilities, harbour dues, stevedoring rates and other useful information regarding the Port of Memel.

Steamship owners and brokers on the Department's Special Register have been given detailed information on these matters and other British companies interested may obtain copies of the circular upon application to the City Office of the Department of Overseas Trade (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

Electric Cargo Handling Plant.

Survey of the Equipment of West Toxteth Dock Sheds, Liverpool.

For several years Messrs. Elder Dempster and Co., Ltd., the well-known steamship owners, have been applying concentrated attention to the evolution of the most efficient and up-to-date cargo handling plant at their West Toxteth Dock sheds, Liverpool. The task of creating still more suitable types of shed equipment is proceeding and we hope at some future date to refer to new developments that are contemplated, but which have not yet reached the practical stage. Our representative was recently given the opportunity of reviewing the cargo handling plant at West Toxteth Dock. His impressions are briefly recorded below.

West Toxteth Dock is that portion of the Mersey Dock Estate where inward cargoes from West Africa are concentrated. The tonage amounts to over 200,000 tons per annum, of which 35,000 tons consists of logs of timber and the remainder, principally casks of palm oil and bagged produce. For the clearance of cargoes from the ship's side, a fleet of 22 electric vehicles is used, and these clear such miscellaneous loads as hides, fibre, palm oil, palm kernels and other oil bearing seeds and nuts, timber, cocoa, etc., all of which is stowed in the sheds or on the quays, pending its removal by barge, motor lorry or horse wagon to local factories, warehouses, etc. As much palm oil is now being imported by tank ships, the tendency is for arrivals in casks to decline.

The plant which Messrs. Elder Dempster have in use at their West Toxteth Dock sheds, includes:—

Type	Battery	Capacity	Traffic Carried
Greenwood & Batley	"Nife," Nickel Alkalyne ...	300 amp. h. 32 volts	All classes
Lansing, Model H...	"Nife" ditto ...	160 amp. h. 48 volts	Any platform load
Lansing, Model D...	"Nife" ditto ...	240 amp. h. 48 volts	Any trailer load
Walker	Edison	360 amp. h. 56 volts	Any trailer load
British Electric Vehicle	Chloride	180 amp. h. 28 volts	General shed work

The other cargo handling plant in service comprises an electric winnowing machine for recovering and cleaning goods spilt from bags;

two 7-ton Goliath electric cranes;
thirty 5-cwt. portable electric cranes;
one 7-ton portable electric crane;
one 1-ton portable electric crane;
two 5-ton steam cranes;
one 1-ton steam crane;
five 10-ton sunken timber scales;
ten 3-ton sunken oil scales;
twenty-two portable bag weighing scales;

and a number of beam scales for weighing tin ore and for checking the weights recorded by the automatic bag scales.

For working the portable cranes, there are 85 electric connecting boxes for the 5-cwt. cranes and 15 for the 7-ton cranes. Throughout the entire length of the West Toxteth Dock shed—a distance of 480 yards and within a radius of 30 yards from the respective electrical connections—the 5-cwt. cranes are operated. The type of connections used for the cranes consists of double pole switch and fuse boxes, of the non-disconnecting type, arranged at intervals throughout the shed, and at a height of 14-ft., to which the 30 yards length of cab tyre cable of the crane is readily connected by means of a plug. A brief specification of the 5-cwt. crane which stands on a base 5-ft. square is:—lifting speed 60 feet per minute; slewing 190 feet per minute; height to underside of hook 14-ft. 6-ins.; electric motor 3 b.h.p. (one hour rated).

For loading off bagged produce, the 5-cwt. cranes staffed with a driver and two men for hooking on the bags, which are lifted two at a time, can fully load a waggon, with 140 bags in 20 minutes, there being only the driver on the waggon for placing the bags in position.

The two 7-ton Goliath cranes can load off 1,000 tons of timber and palm oil per day, and if necessary this figure can be doubled by the full use of the heavy portable cranes. An interesting change recently carried out by Elder Dempster and Co., Ltd., was the conversion of three of their portable 6-ton steam cranes to electrically operated cranes. This has resulted in useful economies, which have already well justified the change.

We were shown details of a new type of automatic cargo handling gear which it is anticipated, will result in further economies in the working of the quay. We hope to publish full details of this gear when the first sets are put in operation.

Every item of cargo as it is discharged from the ship has to be weighed and marked, and unless this operation can be performed quickly, there is a loss of efficiency, which cumulatively would be serious. Many of the cargo carrying vessels of Messrs. Elder Dempster and Co., Ltd., are motor ships and the cargo is discharged from four hatches, sometimes five. On the day of our visit to West Toxteth Dock, palm kernels in bags were being discharged from two holds, barrels of palm oil from the third, and timber from the fourth, and all this produce was taken from the ship's side by powerful little 2-ton composite Greenbat trucks. This Greenbat standard unit is equipped with a patent cask handling gear, and a detachable patent bag, bale and case handling gear; the cask gear is fitted at the control end of the vehicle, leaving the platform space clear. The towing gear is fitted at the platform end, to avoid damage to the special attachments in case the load being towed overruns the truck. The purpose in providing the special gear is primarily to eliminate the time lost in loading and unloading the truck by hand labour. The cask lifting gear is built up with steel channel jib and with cast steel grabs fitted with pivoted ends and cast steel shoe pieces. The grab arms are operated by cranks and link connections and the steel drawn shaft by means of a hard brass nut carried on ball bearings, the thrust being taken on large diameter thrust race. The lifting motor is of 1½ h.p., totally enclosed—compound wound, capable of developing 300 per cent. overload torque for duration of lift.

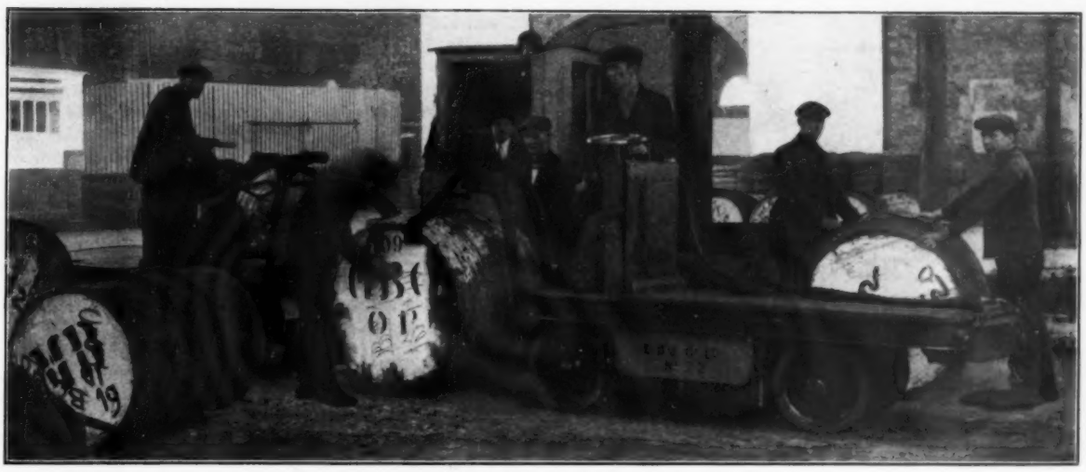
Type of One-ton Electric Portable Crane which deals with Miscellaneous Loads.

Casks of palm oil weigh from 15-cwts. to 17-cwts., and we had the opportunity of comparing two methods of working: (1) manhandling, and (2) electric trucking. When the casks were slung overside, two tractors were working between the ship's side and the scale where every cask had to be cleaned of loose oil and dirt by scraping, and weighed and its weight inscribed, whilst three trucks were working between the scale and the point of storage. Having regard to the distances which had to be traversed this seemed a nicely balanced disposition of trucks. After each cask had been weighed on the sunken scale, the driver of the truck, which is equipped with barrel lifting gear, manipulated the steel grabs to roll the barrel until the bung appeared in the topmost position, to facilitate sampling at the point of stowage. To clear the cask from the scale and to start off, occupied ten seconds and to lower the cask seven seconds. The distance between the scale and the point of stowage was 75 yards, and a round journey was made in 1¼ minutes. The average day's work of three trucks transporting palm oil is about 600 casks per day.

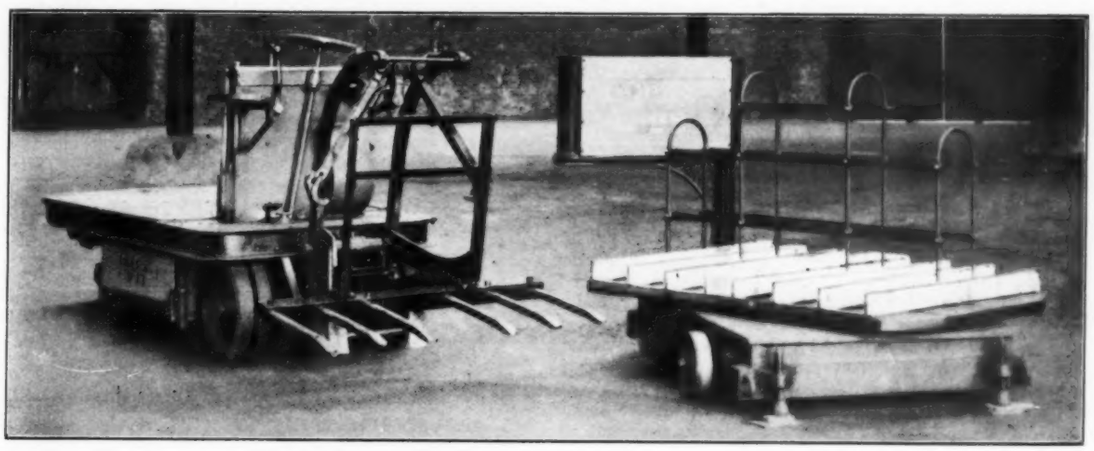
It takes three men four minutes to roll a cask of palm oil 75 yards, or seven minutes to clear each cask. From this it will be seen how great are the economies which electric trucking can be made to yield in the dock sheds. To get the same output from manual labour as from five electric trucks, each staffed by one man, it would be necessary to employ at least 26 dock labourers, whose rate of pay, by the way, is 12s. per day.

Bagged produce—at the time of our visit, palm kernels—was transferred from the ship in slings of five bags, and a gang of men was employed at the quayside in sorting them out according to mark for the particular consignees. The bags are weighed in drafts of five on a Pooley scale fitted with a rotating platform, on which is fastened a number of wood battens of 4-in. by 3-in. section. Each draft of bags is marked with the weight. The platform of the scale is then half rotated,

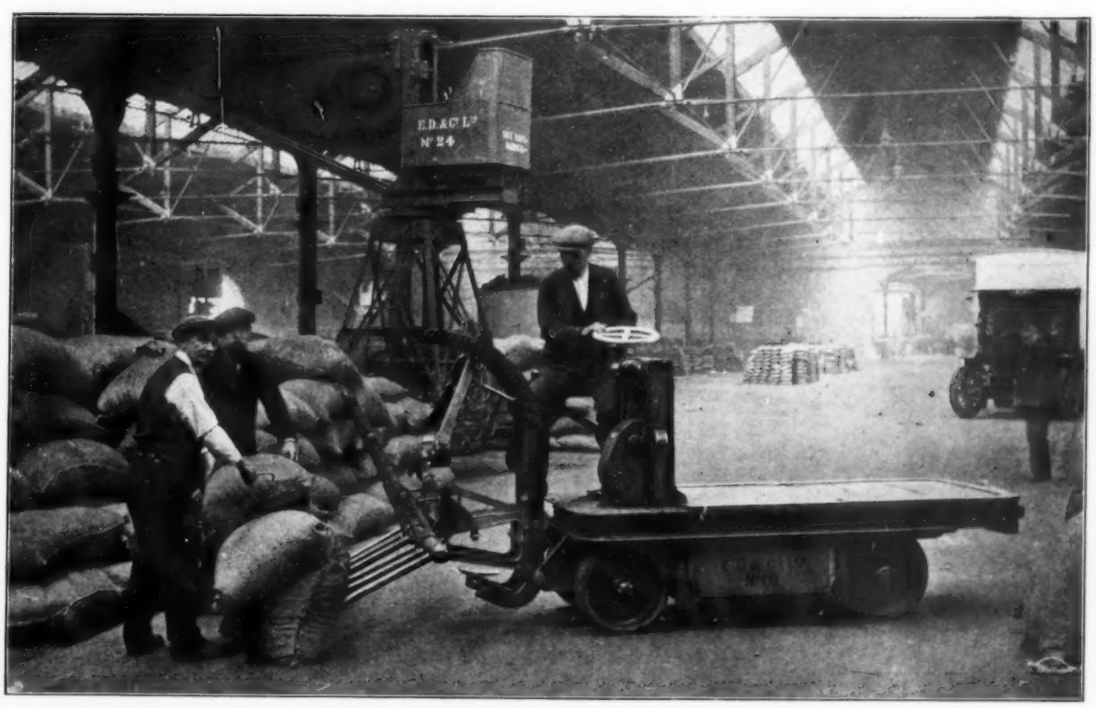
Electric Cargo Handling Plant at Liverpool.



Showing how the composite "Greenbat" truck handles casks of palm oil weighing 15 to 17 cwt.

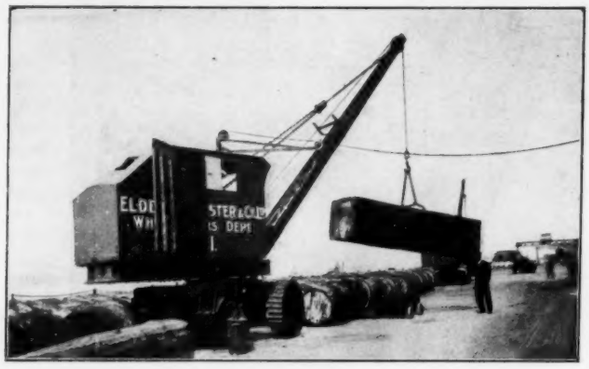


A close view of the "Greenbat" truck and Pooley scale with rotating platform, used for weighing bagged produce.



Electric Trucking with a novel type of composite truck, made by Greenwood & Batley, of Leeds. The truck is here seen depositing a sling of Palm Kernels.

the tractor reverses and the prongs of the lifting attachment are driven into the sections referred to above, underneath the bags, which are then lifted and transported to the pile. The unloading operation is a matter of a couple of seconds. The driver simply depresses a lever which releases the tilt of the carrying attachment; gravitation does the rest. It takes on the

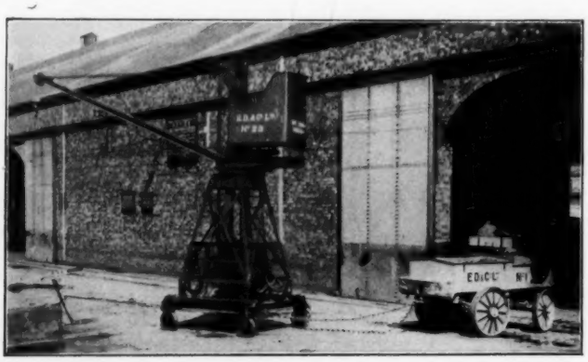


One of the Seven-ton Portable Steam Cranes which has been converted to Electricity. It is here seen lifting a log of mahogany.

average 30 seconds to select the appropriate bags for each weighing; eight seconds to weigh and mark each draft of five; about eight seconds to clear the consignment from the scale. The average run is about 20 seconds, always within the dock shed. From this it will be seen that, allowing for the time taken by the return journey, a 5-cwt. load can be picked up and discharged and the truck ready for the next draft in about a minute and a quarter. Two trucks are employed on each hatch when bagged goods are being unshipped, but if the distance is over 80 yards, it is necessary to put an extra unit in service.

Trucks that are allocated to timber traffic are staffed by the driver and two men who are stationed at the tail end of the log to assist in steering. Lansing Model D tractors, in addition to the composite, are used for this work and the load is carried on a low-built four-wheeled bogey. Logs of mahogany average two tons in weight, and the average size is 20-ft. by 2-ft. by 2-ft. Occasionally logs weighing up to ten tons have to be handled. These are very awkward loads and obviously cannot be handled with the same celerity as either barrelled or bagged produce. The scales on which timber is weighed are about 30 yards from the ship's side and it takes, as a rule, about 30 seconds to couple the timber bogey to the tractor and to haul it to the scale; 30 seconds to weigh and mark the log, and about 20 seconds to haul the log on the quay where it is lifted by a 7-ton Goliath crane and transported to the particular point where it is to be stored. As every log is marked with the identification symbol of the importer, a system of careful classification has to be followed, so as to save time when the consignees' vehicles arrive to load up and to take the logs to the local storage yards, or perhaps to a railway goods depot for forwarding to another destination.

Some idea of the capacity of this fleet of trucks in dealing with heavy tonnages may be gathered from the statement that they can clear from the ship's side 450 tons of palm oil, 250 tons of timber, and from 130 to 160 tons of bagged produce according to its nature, in the working day of eight hours,



Ten-ton Walker Tractor is used for Hauling Portable Cranes from place to place.

per hatch, and stow it in sheds 50 yards wide and on the open quays on the opposite side of the shed. This is an important factor when making comparisons.

In the north-east corner of the West Toxteth Dock shed Messrs. Elder Dempster and Co., Ltd., have an up-to-date and efficiently equipped charging station and repair shop, the plant including three generators 400 amp. at 75 volt capacity, and one of 100 amp. at 100 volt. capacity. These have an output which enable the batteries of the 22 vehicles to be charged in six hours starting at 11 p.m. When work is finished at 5 p.m. the batteries are allowed six hours in which to cool, as it is considered important that the temperature should not exceed 115 degrees at any time. The rate of electrical discharge is naturally very rapid when trucks are employed on palm oil and timber traffic, and the engineering side of the porterage department sees to it that every precaution is taken to ensure the vehicle yielding the maximum efficiency.

Corporation current is received at 460 volts and transformed down to 75. The Park Royal automatic switchboards are equipped with reverse and overload switchgear. Three batteries are charged in parallel, and as there are two panels to each generator, six batteries can be simultaneously replenished from each generator. A Parsons 21 h.p. paraffin engine is installed as a standby unit to drive a generator in the event of a failure in the supply.

The power consumption of the fleet of electric trucks during the last 12 months was 17,000 units and for the cranes 23,000 units, the cost of which is 1.1d. per unit.

As regards tyres, the average life is about four years, which must be considered satisfactory, having regard to the rigorous conditions of operation. After a cargo of palm oil has been cleared from the ship the surface of the dock shed is thick with a sticky oil. Owing to the weight carried on the truck, this seems to be pressed into the rubber, and especially when the vehicle is travelling over the roughly set road outside the dock shed. The walls of the tyres split and break off and this is the cause of heavier loss than actual wear. A special plough attachment is used on one of the trucks to enable it to scrape up all the oil and dirt from the floor.

The speed of the electric trucks, by the way, averages eight miles per hour. Another aspect of the maintenance department is the checking of the dock scales. An expert weighing machine mechanic is employed whose duty it is to supervise the adjustment and overhauling of scales and weighing instruments, to ensure that only correct weights are recorded. The porters weights are accepted by the merchants for all purposes, including freights and sales. It is, therefore, imperative that the weights recorded at the ship's side should be above suspicion—and indeed they are.

Kiel Canal Traffic.

A report received by the Department of Overseas Trade from His Majesty's Consul-General at Hamburg, states that the traffic through the Kiel Canal during the month of July was again exceptionally heavy, 5,743 vessels, aggregating 2,076,203 net register tons, passed through the canal. These figures show a drop of about 350 vessels and 300,000 net registered tons against the same month in 1927, but the position is regarded as highly satisfactory. Compared with the previous month traffic increased by about 700 vessels aggregating 300,000 net registered tons. Of the 5,743 vessels, 2,514 were registered as sea-going steamers, aggregating 1,836,567 net registered tons, and 34 as motor vessels with a total net registered tonnage of 28,920 tons. Of these vessels 2,399 were cargo and passenger steamers, aggregating 1,830,645 net registered tons, 107 were tugs aggregating 5,242 net registered tons, 8 were fishing steamers of 680 net registered tons, 2,936 were sailing craft aggregating 129,590 net registered tons, and 211 were lighters and barges of 59,953 net registered tons.

The vessels were loaded as follows:—112 with passengers, 183 with coal, 127 with stone, 56 with iron, 560 with timber, 803 with grain, 19 with cattle, 191 with ore and other goods in bulk, 1,109 with piece goods, 115 with general cargo, 1,912 empty or in ballast (30 per cent. of the whole traffic).

Freight rates were somewhat higher during the month. This was particularly noticeable with timber and grain. Coal freights were also lively, but ore freights were exceptionally low in comparison with the previous month. Passenger traffic improved still further owing, no doubt, to the holiday season.

Personal enquiries regarding shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

LARGE CONTRACT COMPLETED.

Messrs. Ferguson Brothers (Port Glasgow), Limited, have completed a large contract for dredging plant and barges for an important Corporation in India.

The dredger, which was of the double-ladder type, was completed and despatched last month to her destination. The gross tonnage of this vessel was 1,000 tons and the I.H.P. 1,000.

The barges consisted of three steam hopper barges, gross tonnage of each, 370 tons. These vessels were despatched prior to the dredger.

Notes from the North.

VISIT OF CANADIAN PORT EXPERT.

Mr. K. J. Burns, Port Superintendent to the Harbour Commissioners of Vancouver, British Columbia, is making a two month's tour of England and the Continent, to examine, on behalf of the Vancouver Harbour Commissioners, the systems in the various ports for the expeditious and economic handling of cargo. His itinerary includes Liverpool, London, Southampton, Newcastle, Cardiff, Bristol, Hull, Glasgow, Leith, Manchester, Antwerp, Rotterdam, Bremen and Hamburg.

On his arrival at Liverpool, he explained in an interview, the developments in dock equipment that were taking place at Vancouver. In about eighteen months, he said, the grain elevator storage capacity at Vancouver has increased from 1,250,000 to over 6,500,000 bushels, while last year 85,000,000 bushels were handled, besides a great quantity of flour, the greatest in the harbour's history. For some time past the Harbour Commissioners had desired to facilitate the handling of ships and cargoes by means of the adoption of the dock crane system, and although they had experienced difficulty in getting the different shipowners interested in the project, they had succeeded so far as to instal apparatus of this type at the Ballantyne Pier. They hoped to be able to embark upon an even more comprehensive scheme. He was visiting England to study the different dock systems with a view, as far as possible, of improving things in Vancouver, where they were very largely dependent upon the tramp steamers.

In Vancouver they had a harbour estate comprising 98.2 miles as the crow flies, and although their trade is largely composed of wheat in bulk, there is also a very considerable flour trade. They were having two new elevators built, one with a capacity of 2½ million bushels, and one for the Midland Pacific of half a million. When these are completed they would have a total capacity of 10,420,000 bushels. The Vancouver Harbour Commissioners were anxious to know how the different port authorities on this side of the Atlantic dealt with perishable goods, as well as general cargo, the idea being to improve the existing facilities in Vancouver wherever it is possible to do so.

"We want to hear from shipowners themselves what it is they desire, and wherever practicable we mean to accommodate them," he added. In the year ending December 31st, 1927, the number of deep sea vessels entering Vancouver was 1,123 as compared with 1,071 in the previous twelve months, an increase of 52, and an increase in gross tonnage of 188,779 tons. Of the deep sea vessels entering, 445 were of British register, 327 U.S.A., 155 Japanese, and the remainder distributed among other countries such as France, Norway, Denmark, Holland, Italy, Germany, etc.

In Germany, Mr. Burns will be the guest of the North German Lloyd and the National German Railways. During his stay in Liverpool he was afforded information as to the facilities offered by the River Mersey by Mr. L. A. P. Warner, General Manager of the Mersey Docks and Harbour Board.

A QUICK TURNROUND.

The rapidity with which ocean-going liners can be cleared from the Port of Liverpool has from time to time provoked comment. Here is another instance. The Cunard liner Scythia recently arrived from New York and Boston on a Tuesday morning and left Liverpool again on the Thursday—two days later—for Boston. She was in Huskisson Dock 45 hours, during which time gangs of men worked day and night unloading cargo, which included over 20,000 packages of fruit and 2,400 tons of grain. At the same time the vessel was cleaned up and fitted out with 40,000 pieces of clean linen. The hustle was due to the necessity for dealing with the rush of returning tourists.

DOCK TRAFFIC RETURNS.

The monthly traffic returns of the Mersey Docks and Harbour Board showing the disposal of foreign import cargoes at Liverpool and Birkenhead during the month of July reveals that the total tonnage cleared from the quays was 518,362. The method of disposal was:—By cart, lorry or motor lorry, 294,916 tons; by road motor transport to outside districts, 33,280 tons; by overside delivery, 147,528 tons; by flat and barge ex quay, 18,107 tons; by railway wagons loaded on dock estate, 24,531 tons. The fact is worthy of note that motor lorries are taking from the dock estate to outside districts a greater quantity of traffic than is loaded on to railway wagons.

ADOPTING QUAYS FOR BULK TRAFFIC.

Another important dock improvement is foreshadowed by the Works Committee of the Mersey Docks and Harbour Board which has prepared a scheme whereby it will be possible to load bulk cargo direct from steamer to railway wagons at Carriers Dock. The project will cost somewhere in the region of £23,000 or £24,000. The recommendation of the Works Committee states that in order to provide accommodation for the discharging and loading of bulk cargoes direct from the ship to railway wagons, the engineer be authorised to provide the necessary railway lines, cranes, crane tracks and weighing bridge at a berth 350-ft. long at the east end of the south side of Carriers Dock, Bootle. The scheme will be the first of its kind in the Port of Liverpool, and will be welcomed by both shipping and railway interests, who have been advocating such facility for some time. It is already in operation at other ports, and it will be remembered that in the Gladstone Dock scheme, provision was made for a railway siding adjacent to the dock system. At Carriers Dock, Bootle, there is an open quay space which is ideal for the purpose, and probably the success of the initial scheme will bring others into operation shortly afterwards. The Carriers Dock proposal has been under consideration for a long time. A certain amount of rough cargo (timber, ore, billets, wood pulp, etc.) comes through Liverpool, and the idea of the Carriers Dock plan is to enable this to be dealt with in the easiest and best way by direct transhipment from ship to railway wagon. The berth chosen for the experiment is one which is already in existence. By the introduction of new loading and unloading appliances, electric cranes, etc., it should be possible to deal with larger quantities in less time and at a lower cost than at present. The constructional work is to begin as soon as possible with the laying out of railway lines, which will be connected up to the main line, but the completion of the project will necessarily take some months as the electric cranes and other items in the equipment will have to be specially manufactured. In addition to the railway traffic, there will be facilities for cart traffic, and if the scheme should prove as successful as is hoped, advantage will be taken of the adjoining berth on Muspratt's land for an extension. At the present time Carriers Dock berth is not fully utilised.

HARBOUR WALL REPAIRS.

At the monthly meeting of the Caernarvon Harbour Trust, it was reported by the Dock Repairs Committee that a letter had been received by the Surveyor of the Trust (Mr. Llewelyn Lloyd Jones) from Messrs. Christiani & Nielsen, contractors, respecting the cost of reconstructing the corner of the damaged wall. As time was a most important factor, the matter was gone into by the Chairman, and Mr. Llewelyn Jones. The contractors offered to carry out the reconstruction as day work, to charge the exact time of the men engaged in the repairs, plus an overhead charge of 25 per cent. (to cover use of tools). This was considered too high and the contractors were offered 20 per cent., which was accepted, conditionally upon the work being commenced forthwith.

MERSEY DOCK BOARD ITEMS.

Reductions in the rates for dealing with certain commodities imported and dealt with in the Port of Liverpool, were considered at the meeting of the Dock Board on September 6th. The Warehouse Committee had had under consideration the question of rates at the Board's warehouses, in respect of which they recommended that alterations, effecting considerable reductions, be carried out. In regard to plantation rubber in packages dealt with at the Board's warehouses, consolidated rates were suggested, and it was proposed that there should be reduced housing per land carriage and delivery rates on indiarubber or caoutchouc in packages dealt with at the said warehouses. The suggestions are that for housing per land carriage there should be a reduction from 42d. to 32d. per ton, and for delivery from 30d. to 22d. per ton. In respect of sugar, it has been agreed to reduce the housing per land carriage and delivery rates on sugar dealt with at the Board's warehouses as under:—Housing per land carriage without weighing, from 25.5d. to 22d. per ton; delivery from warehouses from 16d. to 14d. per ton. These recommendations were agreed to.

Mersey Docks and Harbour Board has approved a recommendation of the Finance Committee that in the case of new loans on bond the following rates of interest be adopted in lieu of existing rates:—4¾ per cent. per annum for periods of three and less than five years; 4⅞ per cent. per annum for periods of from five to ten years, as may be arranged.

The following tenders have been accepted by the Mersey Docks and Harbour Board. Works Committee: Electric cable, the Liverpool Electric Cable Co., Ltd. Marine Committee: Five boat beacons, Harland and Wolff, Ltd. Pilotage Committee: Coal for pilot boats, James Chambers and Co.

ELECTRICITY FOR HUSKISSON DOCK.

Having considered the question of supplying electricity to the Cunard Co. at there appropriated berth at Huskisson Dock, Liverpool, the Mersey Docks and Harbour Board has decided that "subject to certain conditions, the engineer be authorised to lay an electric cable to the shed at the berth appropriated to the use of the Cunard Steamship, Ltd., at the north side of the Huskisson Branch Dock No. 1."

BLACKPOOL FIRM'S BIG CONTRACT.

Sir Lindsay and Co., Ltd., contractors of Blackpool and London, have obtained the contract of the State of Jersey for the harbour improvements at St. Heliers, Jersey, Channel Islands. In the reconstruction of the harbour about 100,000 feet of granite and 20,000 cubic yards of granite filling will be required. In addition there will be considerable massed concrete,

steel and timber piling and reinforcing steel. The dredgings (of which there is about 100,000 yards) are chiefly in virgin rock. The demolishing of part of the existing piers and rebuilding the new work inside the half-tide coffer dams, 30ft. high, will enable much of the new structure to be carried out dry. The sea overtops the dams every flood tide, so that at the ebb some 400,000 gallons of water will have to be pumped from inside the dams. While under construction the work will be protected by temporary dolphins. Divers will be engaged for part of the work. The rise and fall of the tide at Jersey is rather exceptional, the maximum at Spring tides being 38-ft. There are many special features of interest in the undertaking, which includes the reconstruction of the Victoria Pier Head and new berth at Albert Pier, the former being in a particularly exposed position. It may be added that Sir Lindsay Parkinson and Co. have been invited by the Crown Agents for the Colonies to tender for the Haifa Harbour Works, Palestine, and Mr. William Parkinson (one of the principals of the firm) left England in the early part of September for Palestine with a staff of engineers to study local conditions. Mr. Parkinson is going overland to Marseilles and will embark on the P. and O. steamship Kaisar-i-Hind for Port Said, and will then proceed up country to Haifa.

166,000 TONS PER ANNUM.

To carry sludge to sea, Salford Corporation has just put in service a new steamer. The vessel, which has been built by Messrs. W. Beardmore and Company, Ltd., of Dalmuir, at a cost of about £50,000, is 240-ft. in length, 38-ft. in breadth, 16-ft. in depth and is designed for carrying 1,000 tons. The River Irwell Conservancy Committee state that this system of sludge disposal is 1s. a ton cheaper than pressing out and disposing of the product as dry sludge. It is anticipated that the vessel, which is capable of 12 knots, will be able to make three trips and four trips in alternate weeks for 48 weeks in the year (allowing four weeks stoppage for boiler cleaning, holidays, etc.), and will remove approximately 166,000 tons of sludge per annum.

FLEETWOOD SEA WALL.

At the last meeting of the Fleetwood Council, it was reported that practically 1,400 yards of the massive concrete sea wall had been completed to a depth of 23.5 feet, equal to a 36-ft. tide. About 100 linear feet of the bull-nose coping had been filled, and it would require a 38-ft. 6-in. tide to get over that portion. The gravel along certain sections had been denuded by tidal scour, and it had been found necessary to put in an apron which was proving very satisfactory. Mr. S. C. Lewis, the consulting engineer, after recent examination of the works, presented a very satisfactory report and declared that the completed section was practically invulnerable. At the south end the bull-nose coping had been completed to the full height for 81 yards. During the last month there had been a marked improvement along the length which had caused much anxiety and groyne 16 had already done good work, for near a bank of sand had accumulated on the foreshore. When the sea wall and groynes were completed there would be an excellent stretch of beach along the front. The beach was accumulating in such a way that there would be no further anxiety.

DOCK BOARD'S QUEST FOR TRAFFIC.

Mersey Docks and Harbour Board has appointed Mr. Watson Rome, the Board's traffic agent in London, to visit Australia and New Zealand with a view to inducing shippers and producers in the two dominions to adopt more economic methods of distribution in this country by shipping direct to Liverpool, goods which are now to a great extent shipped to London, and consequently incur heavy rail charges before they reach their final destination in the North and Midlands of Britain. Before leaving Liverpool, Mr. Rome had the advantage of meeting the United Trades Association, the Liverpool Provision Trade Association, and many leading representatives of the principal trades of Liverpool. He also met representatives of the more important wool interests in Bradford.

The Chairman of the Trade Committee of the Board, Mr. Crichton, told the Board at their meeting on September 13th, that active trading only could demonstrate that the demand for direct shipments to Liverpool was a real one. It was particularly important that the Liverpool houses interested in the produce of Australia and New Zealand should do their utmost to press their demands for regular sailings to Liverpool from Australia and New Zealand, and for all importers of produce from Australia and New Zealand, by united efforts, to make such services successful to the merchant, producer, steamship owner and consumer.

PILE DRIVING OPERATIONS.

Two steam cranes, with driving attachments, have been employed during the past month forcing steel piles into the bed of the Mersey on one of the two jetties being constructed at the Brunswick Dock, Liverpool entrance. A jetty is being run out into the river on each side of the entrance, in an effort to prevent the silting-up and sandbank formation which caused the stranding of the oil-tanker Seminole, and later the steamer Kayeson, repairs to each of which cost thousands of pounds.

REPAIRS TO MANCHESTER 1,800 TON BRIDGE.

The Trafford Road (Manchester) bridge, which swings to let coastwise shipping in and out of the Manchester docks, is being reconditioned. It has swung upon its original rollers ever since the opening of the Ship Canal. to change the rollers and fix new roller paths it will be necessary to jack up the bridge, which weighs 1,800 tons, some six inches or so. While the bridge in its temporary position will be free for vehicular traffic, it will not be able to swing open to water traffic, and arrangements have therefore to be made to accommodate coastwise vessels at the larger docks. Preliminary work is nearing completion and the actual work of reconstruction will begin towards the end of October.

The work will take about forty days and while it is in progress the weight of loads using the bridge will be limited to 12 tons and the speed of vehicles to four miles an hour. The new work will be carried out under the supervision of the company's chief engineer. A similar operation was successfully performed recently upon the Barton Aqueduct, which carried the Bridgewater Canal over the Ship Canal a few miles below Mode Wheel.

Report on Southern New England Ports Issued.

Official Data on Nine Ports.

The Board of Engineers for Rivers and Harbours has just issued Port Series No. 18, constituting one of a series of 22 volumes on the ports of the United States. The report was prepared by the Board in co-operation with the Bureau of Operations of the United States Shipping Board. It covers the ports of New Bedford and Fall River, Mass., Providence and Newport, R.I., and New London, New Haven, Bridgeport, Norwalk and Stamford, Conn. Reports of this series are prepared to meet the needs of the War Department and Shipping Board, and to provide useful information for steamship and railroad companies, importers, exporters, warehousemen, port authorities, commercial organizations and others interested in moving traffic through our ports.

Like its predecessors in the series, the report gives full information with regard to port and harbour conditions, port customs and regulations, services and charges, fuel and supplies; facilities available for service to commerce and shipping, including piers, wharves, dry docks, ship repair plants, coal and oil bunkering, grain elevators, storage warehouses, bulk freight accommodation, floating equipment, wrecking and salvage equipment; railroad and steamship lines, and their charges in connection with terminal service.

The report shows that these nine ports, while inconspicuous in foreign trade, are performing important service directly connected with the industrial and domestic life of the people of New England. In supplying accommodations for vessels bringing coal, oil and lumber, and facilities for handling this traffic, these ports are contributing directly to the welfare of all the people within the territory subject to their influence. The report contains maps showing the area which each of these ports reaches on a favourable rate basis for the distribution of coal and lumber.

Statistics contained in the report show that during six recent years, the waterborne commerce of the nine ports has averaged 11,225,613 tons annually, of which coal comprised 4,795,978 tons; petroleum and products, 3,861,380 tons; sand, stone and lime, 377,436 tons; and lumber products, 163,929 tons. Certain of the ports are conspicuous in the handling of commodities related to local industries. Thus, Bridgeport surpasses the other ports in the tonnage of brass and copper, pig and scrap iron, iron and steel manufactures, and machinery and vehicles; Providence, in the handling of cotton, wool, and textiles, and chemicals and drugs; New Haven, in the handling of fertilizer and dyestuffs; New London, in sugar, syrup and molasses; and Norwalk, in woodpulp.

The important ports have daily steamship service to and from New York, and a large tonnage of high class package freight is moved over these lines. This traffic amounts to about 1,500,000 tons annually. In 1926, its value exceeded $1,240,000,000.

In general, the terminal facilities consist of railroad and steamship owned wharves for handling package freight, and railroad and private terminals for handling coal, oil, and other bulk traffic. Modern piers suitable for ocean vessels and for the accommodation of general cargoes have been built by the Commonwealth of Massachusetts at New Bedford; by the State of Rhode Island at Providence, and by the State of Connecticut at New London. Municipal piers suitable for local and coastwise business are available at some of these ports.

Regular steamship service to Mediterranean ports is available from Providence, as is also regular coastwise service to Baltimore and Norfolk, and numerous lines ply between all of these ports and New York and other neighbouring points.

New Floating Dock at Rouen.

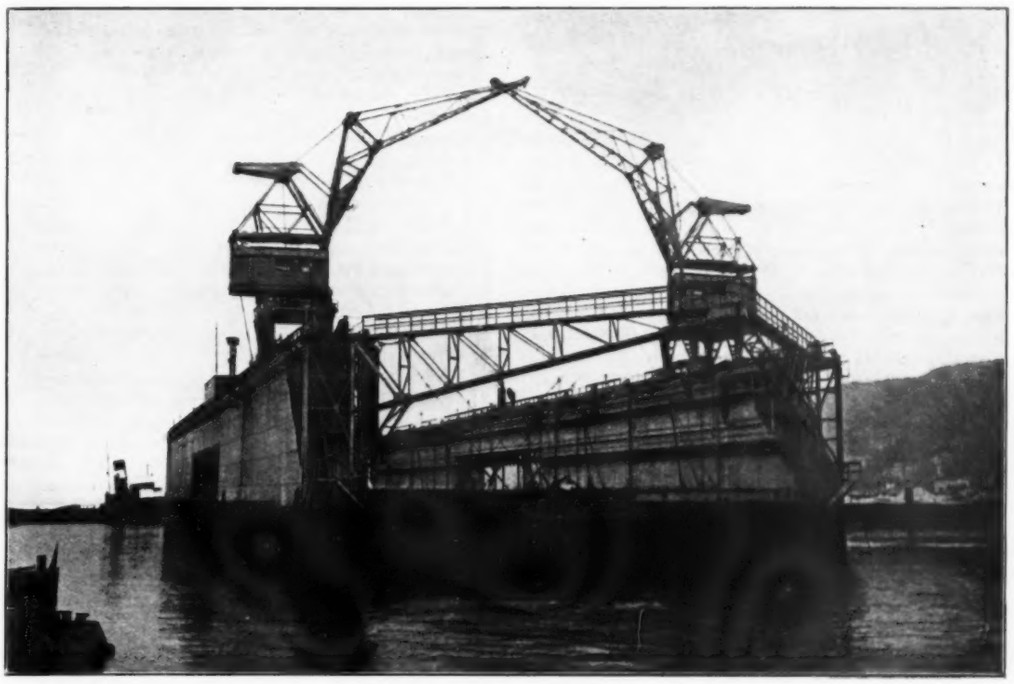
THROUGH the courtesy of Mr. Faroult, President of the Rouen Chamber of Commerce, and of Mr. Barillon, Ingènieur en chef des Ponts et Chaussées and Port Manager, we are able to give the following particulars concerning the development of ship repairing facilities at Rouen.

The 4,200 tons floating dock, which has been in constant use for the past six years, being unable to cope with the new requirements, the Port Authority decided in 1926 to greatly increase careening and repairing facilities.

A special basin has been dug out where the "Petit-Couronne" meadows formerly stood, and further extensions to this ship repairing port will be added in due course to meet increasing demands.

The new basin opens on the Seine through a special entrance which is to be gradually widened. It will acommodate several floating docks which are either in course of construction or at least have been ordered; many berths are available for dealing with repairs which can be carried on without using the floating docks; large areas, provided with rail and road facilities, surround the docks and will be covered with the workshops of the ship repairers, within easy reach of the boats.

It is expected that, owing to the fulfilment of this scheme, maintenance expenses of the Rouen fleet will be considerably reduced.



New Floating Dock at Rouen (lifting power 8,000 tons). The first achievement of the big careening facilities scheme at "Petit-Couronne."

THE NEW 8,000 TONS FLOATING DOCK.

On July 4th, President Doumergue inaugurated the new floating dock which had been put into commission in January, 1928, and is the first big item of the careening facilities to be erected at "Petit-Couronne."

This dock has been designed by engineers of the "Dockbaugesellschaft, vormals: Von Klitzing," and built by the Hamburg firm "Deutsche Werft," in fulfilment of the Dawes plan for German reparations in kind. It can be used by ships 160 metres in length and 25 metres in breadth; the overall width of the dock is 34.10 metres, its length could easily be increased if necessary. The lifting capacity has been fixed to 8,000 tons, though it could deal with 9,500 tons.

DOCK'S STABILITY.

In the case of an 8,000 tons (displacement) boat having her centre of gravity 8.50 metres above the keel, the metacentric radius would in no position be less than one metre, which shows the great stability of the dock.

The dock has been specially designed to accommodate tank steamers which have heavy engines aft. All keel blocks have therefore been calculated to withstand the same maximum strain of 100 tons per metre-length of the ship.

The dock is sunk in a berth dredged to a depth of 12.50 metres below neap tide high water level.

The draught above the top of the keel blocks is seven metres, the water line being then one metre below the bridge.

KEEL BLOCKS.

There is one row of metallic keel blocks 1.20 metres distant from one another and 1.20 metres high thus giving plenty of room for working under the keel.

PROPS.

Twelve props (six on each side) worked from the bridge, guide the entering vessel, while twelve frames, which can be set to the required angle, give her the right trim.

Powerful winches are fixed on the bridges.

PUMPING PLANT.

The pumping plant consists of four electrically-driven 110 h.p. pumps, three only being worked together and a fourth kept ready to cope with emergencies.

The time taken for lifting an 8,000 tons boat is one hour thirty minutes, one hour only for half that tonnage.

All controls are housed in a central cab and worked by the dock engineer.

The current is supplied at 5,500 volts and transformed on the dock.

CRANES.

Each side bridge is fitted with a ten ton travelling crane which is electrically driven and level luffing; the maximum radius is 16 metres.

The dock is berthed alongside a concrete quay fitted with railway facilities; the width of the basin enables tugs and big floating cranes to board the outer side of the dock.

Water is supplied for fire and cleaning purposes. Two fire pumps have a capacity of 100 tons per hour.

AIR COMPRESSORS.

Two air compressors supply compressed air to the various tools.

STEAM BOILER.

A boiler is housed in the dockside and will supply steam to the vessels.

OIL TANKS.

Another feature of the new dock is the provision of two oil tanks of an aggregate capacity of 580 tons for storing the remainder of a tank steamer's cargo, while in the dock. An oil pumping plant has also been provided for.

The Rouen Chamber of Commerce, which, it will be remembered acts as the Port Authority, has ordered a second 8,000 tons floating dock similar to the one we have described, and contemplated putting it into commission in September, 1928.

A 2,500 tons floating dock will also soon be available.

The careening facilities at Rouen are for the present one slip-way for ships 90 metres long, and two floating docks of 8,000 and 4,200 tons respectively.

Port of Southampton Topics.

The prospects for winter work for men in the shipbuilding and ship-repairing trades in Southampton are very fair. Local firms engaged in shipbuilding have met with increasing success in tendering for new work during the past two years and the prospects of new contracts being secured in the near future are regarded as good.

In regard to repair work the prospects are decidedly bright, for in addition to the repair and overhaul of the " Big Six " of the Cunard and White Star Lines, three of the Canadian Pacific Company's liners and four of Red Star Line will, as usual, make Southampton their place of dry docking. Besides this, work on the vessels of the Royal Mail Steam Packet Co.'s and Union Castle Line vessels will be carried out at the conclusion of each round voyage. The greater part of this work will be undertaken by Messrs. Harland and Wolff, Ltd., and Messrs. John I. Thornycroft and Co., Ltd., will also be kept busy. The overhaul season really began with the laying up of the "Empress of France " at the end of September and from then on there looks like being no lull until the middle of February. The 60,000-ton floating dock, owned by the Southern Railway Co., will be extensively used in connection with the overhaul work and when the " Olympic " and " Berengaria " are " laid up," the floating dock and the Trafalgar Dry Dock will be utilised at the same time.

SOUTHAMPTON PREFERRED.

The announcement that in future Southampton will be established as the only English port of call for ships on the North Atlantic service of the North German Lloyd was pleasing news to Southampton port authorities. Hitherto Plymouth has been used by most of the vessels on the homeward service from the States and Southampton has received all the outward-bound ships. The development, which comes into force in the New Year, will mean a big increase in the Company's activities at Southampton and when the new schedule is in full working order the number of ships of the Bremen organisation dealt with at Southampton will be more than double the present figure. Among the vessels that will call, both outward and inward, will be the three biggest German ships, the " Europa," the " Bremen "—the 46,000-ton vessels recently launched—and the " Columbus " (32,000 tons). The appearance of the first two vessels at Southampton early in the New Year will mark the establishment of a very fast service to and from the States. They will be able to make the Transatlantic voyage in five days and the " Columbus," which is to be re-engined next year, will be capable of completing the passage in six days. These three vessels will be responsible for the maintenance of the chief express service and other vessels now running will be released for strengthening the intermediate service. Southampton will reap rich benefit, not only from the concentration of American business at this port, but also from the rapidly-expanding activities to and from the Continent.

ALL-ROUND PROGRESS.

With one single exception the figures for Southampton Docks during August show a substantial increase on those for the same month last year. The number of vessels inward rose from 322 to 360 and the outward total rose from 320 to 362. The gross tonnage was 1,797,194 against 1,598,712 last year, and equally marked increases took place in regard to net tonnage. The inward net tonnage increased from 828,801 to 940,825, and the outward from 784,032 to 900,395. One of the most pleasing features of the returns is the remarkable advance in the cargo figures. The inward increase was 2,789 tons, and the outward 10,242 tons. The latter figure represents the biggest increase recorded in cargo from Southampton so far this year, the advance being from 39,801 tons to 50,043 tons. Thirteen thousand more passengers were handled at the port this August than in August, 1927, for the increase inward was 3,679 and outward 9,592. Inward the total rose from 40,379 to 44,058, whilst outward it advanced from 48,900 to 58,492.

TUG FOR PERNAMBUCO.

A twin-screw sea-going tug, " Estacio Coimbra," which has been constructed by order of the Board of Treasury, State of Pernambuco, for use at the port works at Recife, was recently launched by Messrs. John I. Thornycroft and Co., Woolston. The vessel is designed for an approximate speed of 12 knots. It has a flush deck, raking stern and is divided into six water-tight compartments. The tug carries two 16-ft. lifeboats. Electric light is fitted throughout and the current is supplied by a continuous current compound-wound dynamo with an output of 12 k.w. The machinery consists of two sets of compound condensing engines which develop an aggregate horse-power of 1,200 at about 110 revolutions per minute. There are two centrifugal circulating pumps driven by independent engines, one for each condenser. Two feed pumps are fitted to each engine and a vertical duplex auxiliary feed pump is fitted for service to boilers.

NEW SHIPS COMING.

Next year will see important developments in the New Zealand shipping trade from Southampton. The first of three motor ships now under construction for the New Zealand Steamship Company will make her maiden voyage from Southampton on February 15th. She is the " Rangitiki," and from details of her design it is evident that she will take a high place in the service for which she is being built. Her advent at Southampton will be followed by that of her two sister ships. The Hamburg-America Line, which recently sent the "Orinoco" to Southampton on her first trip, have assigned dates to two more vessels—the " St. Louis " and the " Milwaukee." Both of these vessels are to be motor driven, and have been specially built for the North Atlantic trade. In addition to these additions, the " Magdalena," a sister ship of the " Orinoco," will shortly make her appearance on the West Indies run.

Port Dues in Yugoslavia.

Prevailing Rates of Exchange.

The Department of Overseas Trade has received from the Commercial Secretary at Belgrade, the following list of official rates of exchange for the payment of port dues in Yugoslavia during the month of September, 1928:—

	Dinars.
1 Gold Napoleon	219.05
1 Turkish Lira	247.50
1 Pound Sterling	276.25
1 American Dollar	56.90
1 Canadian Dollar	56.60
1 German Mark	13.56
1 Belga	7.92
100 French Francs	222.45
100 Italian Lire	297.70
100 Dutch Florins	2,282.00
100 Roumanian Leis	34.79
100 Danish Crowns	1,519.00
100 Swedish Crowns	1,529.45
100 Norwegian Crowns	1,519.00
100 Spanish Pesetas	947.90
100 Greek Drachmas	73.85

Personal enquiries regarding all shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

Port of New Orleans.

Shipping on the Inner Harbour Navigation Canal

The movement of vessels of all classes on the New Orleans inner harbour navigation canal amounted to 1,132 vessels of 387,734 tons, an increase of 26 vessels and of 59,462 tons as compared with August, 1927, according to the report of the canal superintendent.

The north-bound canal movement consisted of 51 Mississippi-Warrior barges of 22,584 tons; 33 ocean steamships of 142,510 tons (working freight at public or industrial wharves); 456 other vessels of 25,744 tons; total north-bound, 540 vessels of 190,838 tons. South-bound, the movement was of 57 Mississippi-Warrior barges of 24,686 tons; 28 ocean steamships of 124,314 tons; 507 other vessels of 47,896 tons; total south-bound, 592 vessels of 196,896 tons.

Nationality of Deep-Sea Arrivals.

Flag.	Number.	Gross Tons.
American	118	520,615
British	21	97,087
Brazilian	2	7,807
Belgian	2	11,656
Dutch	4	22,601
Danish	7	16,733
French	4	26,477
German	4	17,839
Honduran	31	67,121
Italian	4	25,473
Japanese	2	13,126
Nicaraguan	5	7,027
Norwegian	40	87,999
Panaman	2	1,336
Swedish	3	9,405
Total	249	932,302

BOARD BUYS $43,837.50 OF COTTON PATCHES.

For the use of the Public Cotton Warehouse the New Orleans Dock Board has authorized the general manager to purchase from Mente and Company 350,000 three-pound wool sack and blue stripe Cuban sugar sack new cotton jute cotton patches for $43,837.50, the lowest bid received.

Harbour Engineering Notes.

EQUIPMENT OF NEW JAPANESE DRY DOCK.

The Japanese naval authorities have installed a new dock in the Kure Harbour at Tokio, with a capacity of 9½ million cubic feet, which must be emptied in 4½ hours. For this giant task six Sulzer centrifugal pumps have been installed, each delivering on an average about 46 gallons per minute. This is one of the largest dry dock pumping plants which has yet been constructed. The head against which the water is pumped varies between 0 and 46-ft. The pumps are driven by 600 h.p. three-phase motors running at 580 r.p.m., and the power required to empty the dock is about 13,000 h.p.-hours. In addition to the six principal pumps, two vertical bilge pumps have also been installed to remove any water which may leak into the dock after it has been pumped dry. Each of these pumps can deliver 5,400 gallons per minute against a head of 65-ft. and is driven by a 160 h.p. three-phase motor.

DOCKYARD POWER STATIONS.

The automatic pressure regulation of generators in both public and private generating stations is so widely used to-day that it is unnecessary to give it special recommendation. On the other hand it is as well to recall that the invention of the automatic pressure regulator resulted in fundamental changes in generator design. The demand, which was maintained for many years, for the smallest possible inherent pressure variation, could finally be dropped and the heavy, expensive types of alternator built to meet this condition disappeared, being replaced by units of lighter design which are cheaper, more economical in working and can be made practically short circuit-proof.

However, in order to prevent the considerable inherent pressure variations of these new alternators from influencing the terminal voltage undesirably, the use of a perfectly reliable quick-acting regulator has become necessary. The duty of this regulator is to compensate effectively the result of load fluctuations by immediately modifying the excitation of the alternator.

The controversy as to whether central regulation of the whole power plant or individual regulation of each separate unit is more desirable need no longer exist. As long as automatic pressure regulators were unknown, it was considered advantageous to link up the field rheostats of the individual generators to a common control, so that the operator on duty could regulate the working pressure by means of a single hand wheel. The first automatic regulators produced were built actually to replace this operator, and to control all the field rheostats.

In many cases, however, it is impossible to combine the whole station control in this way, and it is then necessary to divide the plant into several independent busbar systems, installing a separate automatic regulator for each. Further, the alternators must be controllable by the regulators in whatever manner it may be desirable to connect them, and it is impossible to realise this condition without very complicated wiring arrangements.

As opposed to central regulation, individual regulation may be adopted, each set being equipped with its own quick-acting regulator. In this manner the station may be sub-divided so as to form as many separate systems as desired. The generator sets, each of which, to-day, is always provided with its own built-on exciter, form quite independent units and any fault in the station will affect and put out of operation only the unit involved.

In power stations where the generators are of different designs or are driven by dis-similar prime movers, individual regulation has the further advantage that the quick-acting regulator can be set to suit exactly the characteristics of the machine which it serves.

When the power station load is suddenly thrown off, or if the oil switch of any alternator opens automatically, the individual regulators prevent the machines or the switchgear being subjected to excessive stresses, because the pressure of each alternator is maintained constant even after parallel working has ceased.

In addition to the above application, a quick-acting regulator may be used for the pressure regulation of d.c. generators, pressure regulation at the centre of power consumption in conjunction with induction regulators, speed regulation of d.c. motors, power regulation with battery and booster, power regulation of electric furnaces and electrically heated boilers, power regulation of wood pulp mills, and limiting the short circuit current of synchronous machines. To-day, the quick-acting regulator is being used more and more extensively in conjunction with synchronous motors and synchronous condensers in order to keep the pressure at the end of long transmission lines constant. In another slightly different design this regulator is used for the automatic paralleling of any number of a.c. systems, for which purpose it has given excellent results.

NEW PORTABLE WELDING SETS.

Considerable attention has been given lately to the possibilities of electric welding for effecting all kinds of repairs and carrying out other jobs where it is easier to take the welding apparatus to the work than it is to carry out welding operations at fixed points, and the result of this attention is the development of several types of portable welding apparatus.

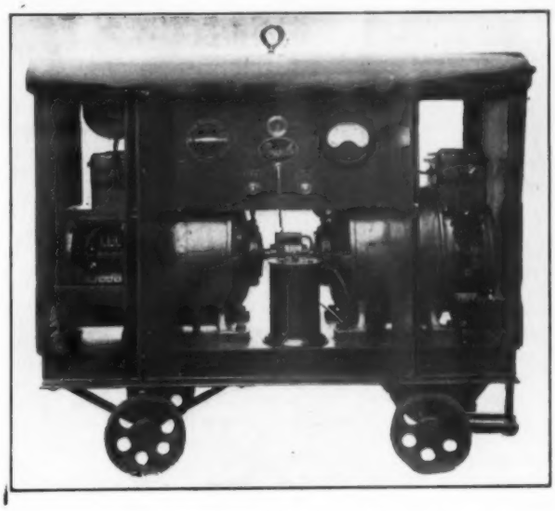


Fig. 1. Single Operator Plant.

Fig. 1 is a view of one of the latest of these sets to be developed, of which several have been supplied to various public authorities and railway companies in this country and abroad. This is a single-welder motor generator of the drooping voltage type, several special features being incorporated to overcome the difficulties previously experienced with this type of machine. These machines are, in fact, the only type available to engineers for welding with equal facility on currents of 25 amps. and also of 200 amps. This is a remarkable advance in the design of welding apparatus, and is obtained by careful design of the field and armature and also by the installation of a special variable inductive resistor in the set. The object of this resistor is to give three ranges of current for light, medium and heavy work. A small portable field regulator is provided with the equipment with which very fine adjustment of the welding current is obtained.

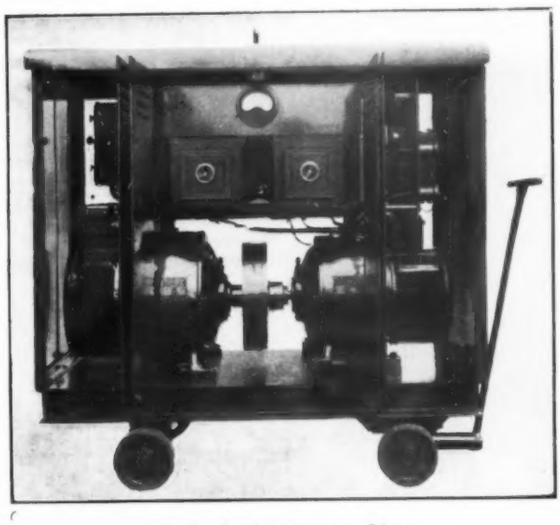


Fig. 2. Double Operator Plant.

Fig. 2 is a double-operator plant, which embodies the type L multiple-operator generator, which is of the constant voltage type working at approximately 45 volts. Both these units are of British manufacture and are designed and made by the Quasi-Arc Co., of London.

LARGE POWER TRANSFORMERS.

With the continued growth of both public and private generating stations, much of the equipment is undergoing considerable modification, and one of the latest of these is the application of air-jet cooling to power transformers, the first example of which is afforded by the transformers installed at the new Longford Power Station by the British Thomson-Houston Co., Ltd. Each of these units has a B.E.S.A. rating, with 55 deg. C. temperature rise by resistance, of 8,350 KVA air-jet cooled, and 6,700 KVA self-cooled.

Before the development of the air-jet cooling system other methods of using air for the auxiliary cooling of transformers had been tried. The chief of these consisted of completely enclosing the tank and radiating surfaces by an outer casing into which air was forced. As, however, the outside casing prevented practically all the natural cooling air from reaching the transformer tank, the self-cooled rating was low, and moreover, it was found necessary to force large quantities of air into the enclosing casing in order to remove the heat.

With the air-jet system, jets of air are projected over the radiating surfaces of the transformer, the scouring action thus produced, breaks up the film of air naturally adhering to the surfaces, and at the same time induces a vigorous flow of air inward and upward from the surrounding atmosphere. The system of auxiliary cooling for oil-immersed, self-cooled transformers has been proved the most suitable as it possesses the following advantages over others: (1) A much smaller volume of auxiliary air is required to obtain the same effective cooling; (2) The self-cooled rating of the transformer may be made any desired percentage of the air-jet cooled rating, and the transformer will continue to operate satisfactorily at the self-cooled rating, with the air jets shut off.

The air-jet cooling equipments are attached to each of the radiators projecting from the transformer tank. The equipment consists of an air chamber, mounted on the tank behind the radiators, from the top and bottom of which project air pipes, arranged on each side of the radiators. The outer ends of the pipes are closed, and the jets of air issue from suitable nozzles located along the horizontal portion of each pipe. The nozzles are sufficiently large to prevent any risk of choking with dust and dirt. With the nozzles designed in this way, silent operation of the air jets is assured.

The air is introduced to the air chamber, from which the jets are fed, by a suitable motor-driven blower. The capacity of the blower will depend on the ratio of the air-jet cooled rating to the self-cooled rating, and also upon the arrangement of the installation. The blowers may be either of the individual type, i.e., one for each transformer, or one blower large enough to give the required air supply for a bank of three transformers may be provided. The size of the motor for driving the blower is often less than 2 per cent. of the total transformer losses, and either an a.c. or d.c. motor can be used, arranged for hand or automatic starting, the automatic operation being controlled either by temperature or KVA demand.

The first cost and maintenance of an air-jet cooled oil-immersed transformer are less than an entirely self-cooled transformer of the same output, and this method of auxiliary cooling can be economically applied under the following conditions: (1) Installations where there is great variation in load; (2) In cases where an increased output is required at some later date, but the incurrence of large capital expenditure at the time of installing is not desired; (3) When water is not available as a cooling medium, or the water is unsuitable or expensive; (4) When high ambient temperatures may be experienced, or wide changes in the ambient temperature are liable to occur.

INCREASING THE LOAD FACTORS OF LIFTING MAGNETS.

A new relay, known as the KY, has just been made available for increasing the load factor of lifting magnets, which it accomplishes by reducing the average current consumed. It is well known that an electric lifting magnet becomes hot with use due to the resistance of the coil, and, as a result of heating, this resistance increases and so reduces the current which can flow. As the pull of the magnet varies roughly as the square of the current the lifting power falls off very considerably, the current being reduced, as explained, due to the heating up of the magnet. On the other hand, a lifting magnet will retain its load, having once lifted it, with considerably less current than was required originally to raise the load.

These facts have been put to practical use in the KY relay, which allows the full voltage to be applied to the magnet only for a sufficient time for the current to rise to its maximum and the load to be lifted, this time being adjustable and being about 10—15 sec., and then automatically reduces the current to a pre-determined amount sufficient to retain the load safely, this amount being about ½ to ⅔ of the maximum. As the time occupied in holding and carrying the load is, as a rule, considerably longer than is required to pick up the load the magnet remains cooler on account of the reduction in current. This results in the maximum current which is available for lifting being higher, due to the cooler magnet, so that it is capable of handling a bigger tonnage.

In practice it has been found that a 52-in. circular magnet, working continuously on a scrap heap, and which took 50 amperes cold, reached a temperature which reduced the current to 36—38 amps., and consequently only handled a tonnage corresponding to this current. This same magnet using the KY relay adjusted for 10 secs. with full power, and then reducing the current (cold) to 35 amps., reached a temperature corresponding to 44 amps. for lifting and 31 amps. for carrying, and therefore handled a tonnage corresponding to 44 amps. This meant that a 30 per cent. increase of lifting capacity was obtained. It was found that with this reduction of current there was no tendency for any of the load to drop off, and as a test a cylinder of cast iron weighing 6 tons, and which had only a line contact with the magnet, was carried out quite safely by the crane operating on the reduced current.

In many cases it is found that crane operators are in the habit of switching the current on a magnet on the idle return journey for the sake of convenience, and long before the magnet is ready to pick up its load. This practice results in further heating the magnet and waste of current. The KY relay prevents this practice, as only a short time is available with full power and this time must be utilized in picking up the load. If, however, a longer time is needed with full power for gathering up a scattered load for a full lift, any number of consecutive 10 secs. with full power can be obtained by switching off and on again.

The KY relay, which is designed and manufactured by the Igranic Electric Co., is an apparatus for inserting a resistance in series with the magnet at the end of a pre-determined time, and comprises a contactor for short-circuiting this resistance when the current is first switched on to give full power, and a switch controlled by an adjustable dashpot for opening the contactor to insert the resistance at the end of a pre-determined time.

Wireless at Sea.

New International Radio Maritime Committee Formed.

A conference of wireless maritime associations representing the principal wireless maritime companies of the world, was held in September, at San Sebastian, Spain.

At one meeting of this conference an International Radio Maritime Committee was formed consisting of representatives of the following companies:—

The Marconi International Marine Communication Co., Ltd., England. Radio Communication Company, Ltd., England. Deutsche Betriebsgesellschaft fur Drahtlose Telegraphie m.b.H., Germany. Hispano Radio Maritime, Spain. Compagnie Radio Maritime, France. Societe Anonyme Internationale de Telegraphie sans Fil, Belgium. Nederlandsche Telegraaf, Maatschappij, "Radio-Holland," Holland. Radiomarine Corporation of America. Societa Italiana Radio Marittima, Italy. Norsk Marconikompani, Norway.

The purpose of this International Committee is to pool the vast experience and specialised wireless knowledge held by this world-wide association of wireless companies for the benefit of shipowners, passengers, and the public generally, and to ensure that the utmost possible service is rendered to all those who are interested in the development and use of wireless at sea.

Mr. A. Hubert, Managing Director of the Belgian Company, was elected President of the new Committee and Mr. F. S. Hayburn, General Manager of the Marconi International Marine Communication Co., Ltd., was elected Vice-President.

MORE CONTRACTS FOR TYNESIDE.

It is announced that Sir W. G. Armstrong Whitworth and Co., Ltd., have secured contracts for the construction of eleven broad gauge Superheated Main Line Locomotives and Tenders for the Madras and Southern Mahratta Railway Company, and thirty-two large Superheated Locomotive Boilers for the Bengal Nagpur Railway Company, together with other locomotive accessories.

Other contracts recently secured by this firm include locomotives for the Trinidad Railways, locomotive boilers for the Cordoba Central Railway and a quantity of locomotive spares for various Home and Foreign Railways.

These contracts will be carried out at the Scotswood Works, Newcastle-on-Tyne, and the Locomotives will be shipped in fully erected condition in accordance with the firm's usual practice.

SHIPPING TRAFFIC IN HAMBURG IN AUGUST, 1928.

A report received by the Department of Overseas Trade from His Majesty's Consul-General at Hamburg states that the total tonnage entered at the port was 135,000 tons more than in July and there was also a small increase in the total tonnage cleared. The tonnage cleared with cargo was up 64,000 tons.

British shipping in August amounted to 248 vessels (474,239 tons) entered and 242 vessels (457,996 tons) cleared compared with 220 vessels (406,515 tons) entered and 216 vessels (404,124 tons) cleared in July.

German tonnage in August amounted to 900,857 tons entered (827,173 tons in July) and 875,717 cleared (882,834 tons in July).

Personal enquiries regarding shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

The Harbour Plan of Chicago.

Development of Group of South Michigan Harbours part of Scheme advocated by Independent Committee on Chicago Harbour and Port Survey.

(*Continued from page 350.*)

PROPOSED TERMINAL FACILITIES.

GENERAL REQUIREMENTS.

THE harbour facilities required locally may be grouped into two general categories that affect matters of location and general layout; these are commercial terminals, and industrial and bulk interchange terminals. Commercial terminals are necessary for the handling of miscellaneous package freight which now moves by lake and is expected to move by barge waterway, and via the St. Lawrence Waterway as well. Industrial and bulk interchange terminals will be required for the heavy raw materials of industry and other bulky commodities. A comprehensive water terminal plan for the Chicago region must make adequate provision for each of these types of development.

Having in mind the source and destination of the water traffic that may result from the several improvements heretofore discussed, any general scheme of harbour development for the Chicago region should also provide plans for terminals for the handling of water-borne freight as follows:—

(a) Local lake freight (i.e., freight originating from or destined to points in the Chicago region).
(b) Interchange lake freight (i.e., that originating from or destined to the hinterland).
(c) Local barge freight.
(d) Interchange barge freight.

The interchange facilities will require arrangements for transfer between water carriers as well as between water and land carriers.

The general plans for these terminals should be worked out in such a way that facilities may be added promptly, economically, and indefinitely, so that all reasonable future demands of water-borne traffic in the way of terminal facilities may be met.

The plans should also relieve any present demand for increased and improved facilities, and the programme for present relief should be co-ordinate with the general plans for future expansion.

Consideration should be given to local problems such as street traffic and lake front improvement, to zoning ordinances and to present use of property.

The need to plan for indefinite expansion calls for the selection of sites and the arrangement of facilities in such a way that a very extensive development may take place in the future with space remaining for the addition of more units of all kinds. The best way of insuring the fulfilment of this condition is to locate and design the facilities upon assumptions of volume of commerce to be handled which are sufficiently broad to include all reasonable growth for many years to come, at the same time arranging the layout so that other units may be added should they ever be desired.

COMMERCIAL LAKE HARBOURS.

SPECIFIC REQUIREMENTS.

Considering the package freight business by lake only and using specifications as to sizes of slips, anchorage basins, and channels, also as to capacity of piers, railroad connections, unloading devices and the like which appear to apply to local conditions, the commercial harbour or harbours of the future should have the following general features and still be capable of further expansion:—

Anchorage area, acres	1,287
Slip and channel area, acres	430
Total water area, acres	1,717
Commercial piers, acres	100
Yards and approaches, acres	233
Total area—acres, water, and land	2,050
Total berthing space—feet	34,336
Transit shed floor area—square feet	4,580,000
Transit and storage shed—square feet	13,730,000

To reduce pick-up and delivery by truck to a minimum, a fairly centralised location is desired for the commercial lake terminals. Over 75 per cent. of the population of the region lives within 15 miles of the centre of the City of Chicago. Increasing the radius to 20 miles takes in only a few more people, decreasing it to 10 miles excludes a large population, so the location should be within the zone established by the 15 mile radius.

A connection to the Illinois Waterway is essential, either directly by canal or river, or by means of a protected passage along the lake front to a connecting canal or river.

The requirement that indefinite expansion should be possible limits the location to the lake front, for while some interior location such as Lake Calumet might provide for practically unrestricted increase in dock facilities, a definite upper limit is fixed by the capacity of the connecting channel to pass the ships between the harbour and Lake Michigan.

Direct and adequate connection to two or more railroads or a belt line should be available.

Consideration of these factors limits the selection of a site for the commercial lake terminal to the following general locations:

1. Lake front between Oak Street and 41st Street.
2. Lake front between 86th Street and a mile east of the old entrance to Wolf Lake.

Between Oak Street and 41st Street, there are approximately 6 miles of lake front of which about 3 are reserved for park purposes—i.e., between Randolph and 16th Streets and between 31st and 41st Streets—but there is no physical reason why the water area off these park lands could not be available for anchorage purposes. This intervening stretch of water, which should be kept open, necessitates a complete harbour development at either end, if a centralised commercial terminal is to be provided.

If the terminals are so arranged that use may be made of this intervening stretch of open water for anchorage purposes it is not necessary to provide additional anchorage space within either development as the requisite open water area will be found between Randolph Street and 16th Street.

TERMINALS BETWEEN OAK STREET AND RANDOLPH STREET.

Between Oak Street and Randolph Street are the lake portions of Harbour Districts Nos. 1 and 2. The United States Government has built two breakwater systems, one about 1,800-ft. to the east of Grant Park, enclosing a water area of about 225 acres largely used as a yacht harbour at present; the other a mile to the east, extending to the north and west to the shore near Oak Street. This exterior breakwater shelters the entrance to the Chicago River and protects the boats at the outer piers.

Railroad Connections.—Two railroads reach the lake front near the mouth of the Chicago River. On the north side the Chicago and Northwestern Railway serves terminals on both sides of Ogden Slip, but does not reach the Municipal Pier. While most of the line is double-tracked, part of it is not. Its present unused capacity is estimated to be about 200 cars per day in each direction. If double tracked throughout, the line might have an approximate unused capacity of 500 cars per day each way. The Chicago and Northwestern Railway makes no direct interchange of cars with other trunk lines, intermediate switching being necessary in each case.

On the south side of the mouth of the Chicago River, the Illinois Central Railroad together with its tenant roads, the Michigan Central and the Chesapeake and Ohio, has a large freight terminal development. The main lines determine the capacity of future freight installations; they are now in use for passenger and freight service. It has been estimated that about 600 cars a day in each direction may be added without overcrowding the main lines. It will not be practicable to enlarge the capacity by the construction of one or more tracks through Grant Park. The Illinois Central Railroad makes direct connections with all principal trunk lines.

To handle the daily car movements which the future traffic of a centralised port development will necessitate, and to provide facilities for expansion, it is apparent that recourse must be had to additional rail connections. Possible solutions are:—

1. By tunnel west from the Municipal Pier, under Grand Avenue; under the North Branch of the Chicago River, paralleling the Chicago and Northwestern Railway to rise to grade and thence to elevation between Western Avenue and Sacramento Avenue, thence west to the Belt Railway of Chicago at Cicero Avenue.

2. By tunnel under Grant Park to the Illinois Central Railroad right of way at about 13th to 16th Street; thence west on the proposed 18th Street air line to the Chicago and Western Indiana Railroad, thence south to the Belt Railway of Chicago.

3. By tunnel under Grant Park to the Illinois Central Railroad right of way at about 13th to 16th Street, thence south to 31st Street paralleling the Illinois Central, thence west to the Chicago and Western Indiana Railroad as before.

4. By tunnel under Grant Park to a right of way paralleling the Illinois Central from 26th Street south to connect with the Chicago Junction Railway at 44th Place.

Railroad yards should be provided at the terminal site to permit the following operations:—

Classification of inbound cars as to pier destinations.

Classification of outbound cars as to line destinations.

The first is absolutely essential as this operation cannot be conducted any distance from the piers. The second, while not essential, is desirable, as an additional yarding is avoided in the interior if line classifications can be made on the lake front.

Railroad Yards.—Investigation shows that there are several solutions of the railroad yard problem in Harbour District 1 and 2. All require the use of reclaimed land on a large scale, however. The distance between the northern and southern boundaries of the harbour areas is rather scant, as is also the available space landward of the Municipal Pier. However, by putting all trucking on elevated streets the full dimensions may be utilised for yards and approaches. Approximately 20 acres of land are required for every 1,000,000 tons of cargo (both in and outbound); for the traffic for which the harbour is being designed a little over 200 acres will be required. Electrification of all rail service would be involved.

Street Traffic.—If the harbour is to handle the traffic for which designed, the maximum daily movement of trucks to and from the commercial harbour would amount to about 4,500 in each direction. Street connections capable of absorbing a two-way movement of at least 9,000 vehicular movements per day must be available, for the dumping of that additional volume of traffic in the downtown section of Chicago without compensating for it in any way would be extremely short-sighted. The plan should include means of by-passing the congested district in such a way that projects for relief from other traffic ills will not be interfered with in the least. The only reasonable solution that appears to answer this requirement is the continuation of the double-decked street development from Michigan Boulevard to the lake, and along the river as far south as Roosevelt Road. Then the heavy truck movement could encircle the loop; loop destinations could be reached with a minimum of travelling in the loop, and external points could be reached without interfering with loop traffic except at the bridges over the river.

Obviously, the port development should not have to bear all the cost of this improvement, for the upper level would be used for automobile traffic, and part of the lower level would be used for trucking for other purposes. But since a large down-town port development may create the necessity it would be logical to make it bear a good share of the expense.

Barge Waterway Connections.—The Chicago River and the Chicago Drainage Canal form the links between any harbour development near the mouth of the Chicago River and the Lakes-to-the-Gulf Waterway. This connection is so obstructed by bridges affording limited vertical clearance that the passage of any number of unloaded package freight barges is out of the question. Lateral clearances, while also limited, are believed to be adequate for the comparatively light barge-to-ship interchange traffic that is expected to materialise. Since increasing the vertical clearance of the bridges over the Chicago River is out of the question for many years at least, it probably will be necessary to handle a portion of the ship-to-barge interchange traffic by lighters.

TERMINALS BETWEEN 16TH STREET AND 41ST STREET.

The park development which extends from Grant Park to Jackson Park includes the entire lake front between 16th and 41st Streets, though lakeward of the proposed park and between 16th and 31st Streets lies Harbour District Number 3. There are no harbour works of any sort in this area, but the Government breakwater opposite the mouth of the Chicago River now reaches as far south as Adams Street extended, and its prolongation in a southerly direction to afford the necessary general protection to any facilities to be provided would not be difficult.

Railroad Connections.—The so-called Lake Front Ordinance of July 21st, 1918, which established Harbour District Number 3, provided for four direct connections to the lines of the Illinois Central Railroad at points to be selected between 16th and 31st Streets, each connection to be of two tracks. No exact locations were specified. This ordinance also provides for connections to railroads west of the right of way of the Ilinois lCentral Railroad, one via the proposed 18th Street connection, the other between 18th and 31st Streets at a point to be selected when required.

While it would be comparatively simple to make a direct connection with the lines of the Illinois Central from any part of a harbour development in Harbour District Number 3, the only way to make such a connection and not mar the beauty of the parks would be by tunnel. The four different connections authorised in the ordinance probably could be made in this fashion as far as physical difficulties are concerned, but as there is no foreseeable necessity for more than a single two-track connection, only one need be considered.

Likewise there are serious objections to a railroad viaduct over the parks to the 18th Street air line or to any other cross town air line connection north of 31st Street. To reach the 18th Street Viaduct by tunnel from the harbour area, the tunnel must cross under the park near 31st Street, curving north to parallel the east right of way line of the Illinois Central Railroad, and the track must then rise on excessive grades to cross the Illinois Central Railroad near 18th Street.

A 31st Street cross town viaduct with the track curving north after crossing over the Illinois Central Railroad, and then dropping to cross under the park in a tunnel at 16th Street, would introduce the same difficulties.

To conform with the general principle that rail connections be made to at least two railroads which made direct interchange with most of the other railroads in the Chicago Junction Railway at 41st Street is advisable. This crosses the Illinois Central on a viaduct which comes to grade at about 44th Place.

The best solution appears to be to run a two-track tunnel southward under the park and lagoons, the southern portal being located east of the Illinois Central tracks south of 39th Street and the railroad coming to the grade of the switchback of the Chicago Junction Railway. This would provide a direct connection to both the Illinois Central Railroad and the Chicago Junction Railway and avoid all obstruction of the park.

Street Connections.—The Lake Front Ordinance provides for harbour approaches by street as follows:—

1. " An 18th Street Subway " extending from the end of East 18th Street at right angles under the right of way of the Illinois Central Railroad.

2. " A 22nd Street Harbour Viaduct " extending across the lands of the railroad and conforming in design and appearance to the viaduct already constructed for automobile traffic.

3. " A 31st Street Harbour Viaduct " extending from the westerly line of the right of way of the railroad immediately north of and contiguous to the park viaduct now under construction.

It is believed that two of the three street connections to the interior of the city would be sufficient for an almost indefinite period. There is a large north and south traffic to be intersected, but with two outlets there is ample opportunity for dispersion, and an addition of 9,000 or more vehicle movements daily could be absorbed readily. Additional crossings of the park and Illinois Central Railroad would be practicable at any future time, but their necessity is not apparent now.

Barge Waterway Connections.—There seems to be but one practical solution to the problem of providing a suitable connection to the main Drainage Canal and the Illinois Waterway. This is a route by way of a protected channel along the lake front between Harbour District Number 3 and the mouth of the Chicago River. While the main harbour breakwater would protect ships and lake-going tugs and barges, it would not be close enough to shore to afford sufficient protection to river craft of comparatively frail construction. An auxiliary breakwater is therefore required extending from the gap in the old Government breakwater east of Grant Park to a safe entrance into Harbour District Number 3.

TERMINALS BETWEEN 86TH STREET AND A MILE EAST OF THE OLD ENTRANCE TO WOLF LAKE.

In this section there are approximately four miles of water front, of which the two to the north are occupied by two steel companies and Calumet Park. The 1,500-ft. of frontage immediately south of Calumet Park is unoccupied at present; then comes 2,500-ft. now being improved by the State Line Generating Company for a power plant site; then 3,000-ft. of unused frontage which is privately owned and extends to the piers which mark the former entrance to Wolf Lake. South of these piers there is a park owned by the City of Hammond.

Calumet Harbour occupies the first two miles of lake front on the north; a Government breakwater protecting the entrance to the Calumet River also affords an anchorage basin of about 400 acres. Three main line railroads and one belt railroad parallel the lake shore a short distance back so that all harbour lands will have to be reclaimed from Lake Michigan, except where it is possible to cross these railroads and make use of the unoccupied areas in the vicinity of Wolf Lake.

The commercial harbour development should be as far to the north in this section of the lake front as it is possible to locate it; first, because it will be nearer the centre of the metropolitan area and average trucking distances will be reduced; second, because it will be nearer the Calumet River and barge and lighterage traffic will be facilitated; and third, because industrial harbour development may ultimately require most, if not all, of the rest of the available lake front as far as Indiana Harbour.

Railroad Yards and Connections.—There are several large tracts of land in the vicinity of Wolf Lake which are suitable for use as railroad yards, so that it will be unnecessary to reclaim the bed of Lake Michigan for this purpose. These lands may be had for so much less than it costs to reclaim the bed of Lake Michigan that, in spite of the disadvantage of having the major yard development some distance from the harbour, it is believed wise to take advantage of this situation. In either event it is necessary to have a railroad line along the lake front which cuts across the main lines of railroad previously referred to, as it is desirable to make contact not only with the Elgin, Joliet and Eastern Railway, the eastern-

most of the marginal lines, but also with the Indiana Harbour Belt Railroad and others which are in the interior.

The harbour railroad yards near Wolf Lake therefore would be connected with the pier tracks either by way of the tracks of the Elgin, Joliet and Eastern Railway, on a wheelage basis, or over an independent right of way. In the first instance, the crossing of the main lines might be by subway near the entrance to Wolf Lake. In the second, an elevated line probably would be required, either over the right of way of the Elgin, Joliet and Eastern Railway or over the edge of the property of the State Line Generating Company, as space may not be available for a line on grade. In this latter case the crossing of the main lines would be over a viaduct.

From the harbour yard direct contact may be made with the Indiana Harbour Belt Railroad and with the Elgin, Joliet and Eastern Railway. Direct connections could also be made at comparatively small expense with several other roads, such as the Chicago and Western Indiana, the New York Chicago and St. Louis, the South Chicago and Southern and the Calumet Western.

Street Connections.—Street connections will be expensive to provide on account of the intervening main lines of railroad. At 100th Street there is now a subway under all but the Elgin, Joliet and Eastern Railway, and investigation shows that it is practicable to raise this line sufficiently to permit a grade separation not only at 100th Street, but also at 99th and perhaps even at 98th Street. One Hundred Second Street is as far to the south-east as a subway may be constructed without encountering serious difficulties with the railroad yards and switch tracks.

A right of way for a street along the edge of Calumet Park will be necessary to connect the harbour area with the existing subway at 100th Street and the others that may be built later at 99th and 98th Streets.

Barge Waterway Connections.—The Calumet River, the little Calumet River and the Calumet-Sag Channel would form the connection between a commercial harbour at this location and the main Drainage Canal and Illinois Waterway. With the commercial barge terminal on the Chicago River or main Drainage Canal, ship-to-barge interchange would be handled largely by lighters, for the interior connecting waterway is circuitous and includes the Sag Channel, which is narrow and obstructed by fixed bridges, while the exterior route utilises the open lake, which is hazardous for ordinary barge traffic.

The proximity of this development to the large electric power station of the State Line Generating Company, representing an investment of $100,000,000 for the service of Chicago industries, necessitates the taking of such measures as will insure that a free circulation of large quantities of condensing water is not interfered with. Culverts or tunnels under the harbour works may have to be provided for this purpose.

RESUME.

The foregoing investigations lead to the conclusion that centralisation of commercial lake terminal facilities is impracticable, particularly when the disadvantages of each alternate scheme are considered. These are set forth briefly below:—

Municipal Pier Area.—Limited extent of lake front; congested condition of nearby streets; restricted space for railroad yards; high cost of adequate rail connections; obstructions to barges along channel to barge terminal necessitating lighterage.

Harbour District Number 3.—Interference with park programme; high cost of adequate rail connections; obstructions to barges along channel to barge terminal plus added cost of auxiliary protection on lake front for safe passage of barges to mouth of river.

Near mouth of Calumet River.—Remoteness of location with respect to those shippers and consignees served by truck; necessity of lightering some barge-to-ship transfers from barge terminal to ship harbour; or ultimate widening of Calumet-Sag Channel and raising of bridges to provide headroom of at least 21-ft.

Most of the disadvantages applying to the first two plans cannot be overcome except at what might be prohibitive costs. A few could not be overcome at all.

Since the alterations to the Sag Channel are involved in the best solution of the problem of providing adequate industrial and bulk interchange terminal facilities (to be discussed later), the cost is not entirely chargeable to the commercial terminal project. Therefore, this disadvantage to the third lake front location (i.e., near the mouth of the Calumet River) may be overcome at a reasonable cost.

The first disadvantage to the third location, i.e., its remoteness with respect to local users, may be partially overcome by making sufficient provision in the way of terminal facilities at the Municipal Pier area for the service of passenger vessels and express cargo liners, and locating the rest of the commercial lake terminals near the mouth of the Calumet River. There is ample space near the Municipal Pier for the passenger and express cargo facilities, and rail and street connections may be provided. No disadvantage would accrue to the vessels from such a separation of facilities, as there is a distinction among them which conforms closely to this arrangement.

The second disadvantage to the third location is common to all.

RECOMMENDED SOLUTION.

The arrangement of the major commercial lake terminal developments for the Chicago region which seems to combine the greatest number of advantages with the least serious disadvantages is:—

For lake passenger vessels and express cargo liners; near the mouth of the Chicago River.

For general commercial traffic; at the inter-State harbour south-east of the mouth of the Calumet River.

To conform with this ultimate solution the general arrangement of commercial harbour facilities in Chicago Harbour includes the construction of an additional pier parallel to the Municipal Pier and immediately to the north of Randolph Street extended including the necessary railroad yards and connections for the service of both piers by both the Illinois Central Railroad and the Chicago and North-Western Railroad. This development may be made at a reasonable cost and the land traffic resulting, both rail and street, will not tax the capacity of existing approaches.

This arrangement does not afford ideal railroad service, for it provides direct connection to only two of the main lines entering the city and does not give belt line service. However, the two connecting lines interchange with all of the others, so that the only disadvantage that exists, as compared with a belt line connection, is one of possible inferior service, which sometimes results when a main line gives preference to its own traffic in switching.

The route selected for the permanent rail connection between the two piers is by way of a fill paralleling the property of the Illinois Central on the east and leading due north from the prolongation of Randolph Street to the lower level of the proposed Outer Drive bridge, thence north on that level to Illinois Street, thence east to the track system of the Municipal Pier.

On the south side of the Chicago River the approaches to the bridge should be arranged so as to provide a paved passageway for trucks as well as sufficient space for a single line of railroad. The truckway would then be available as a connection with the lower level of the proposed extension of Wacker Drive east of Michigan Boulevard.

A small switching and storage yard is provided on the north side of the river to sort cars for position on the Municipal Pier, and to permit full train movements to be made between the pier and the classification yards of the railroad. This yard can be provided to best advantage about 600-ft. south of, and parallel with, the Municipal Pier. Its southerly retaining wall would be the auxiliary breakwater which now protects the south side of the Municipal Pier. It should have a standing capacity of about 100 cars with provision at its outer end for a locomotive to return around the yard.

In connection with this railroad yard it would be desirable to build a short length of covered transfer platform to facilitate direct transfers between rail and lake carriers. There is room for such a facility at the north-east of the yard, where a platform 700-ft. in length by 40-ft. in width could be provided.

A storage and switching yard is planned on the south side of the Chicago River as well, not only for quick service of the new pier, but also to eliminate all unnecessary car movements over the bridge. This yard will be larger than the one on the north side, as it is expected that most of the rail-lake interchange traffic will be handled over the Illinois Central Railroad.

All trucking to and from the new pier will take place on a level over the tracks. This will eliminate interference at grades and increase the capacity of the pier.

Should it be necessary for the Outer Drive bridge to be constructed farther east, the rail connection across the river could be made to conform to such a location by shifting the entire harbour development on the south side to the east. The costs will not be affected materially.

No details are submitted for the plans for the facilities proposed for handling general commercial lake traffic at the inter-State harbour south-east of the mouth of the Calumet River. The general features of this development and the compromise of locating a few of the commercial harbour facilities at the mouth of the Chicago River in no wise affects these general plans.

COMMERCIAL BARGE HARBOURS.

REQUIREMENTS.

In view of the volume of traffic which the commercial barge terminal is likely to have to handle, a fairly large development is going to be necessary in the course of time. The estimated possible future traffic through this terminal is 2,200,000 tons per year. This load will require the provision of facilities as follows:—

Requirements of future commercial Barge Harbours:—

Anchorage water area (acres)	220
Ship and channel area (acres)	55
Total water area (acres) ...	275
Commercial piers or wharves (acres) ...	22
Yards and approaches to commercial terminals (acres)	70
Total area, land and water (acres) ...	367

Length of berthing space (feet)	8,800
Transit shed floor area (sq. feet)	1,000,000
Transit and storage shed floor area, combined (sq. feet)	3,000,000

The Chicago River is the waterway connection between the Main Drainage Canal and lake front terminals in Harbour Districts Nos. 1, 2 and 3. Due to the numerous obstructive bridges over this connection it would be impracticable to locate the barge terminal on the lake front. To avoid most of the bridges this terminal will have to be west of Loomis Street on the south branch of the river.

The capacity test applied in this case requires 220 acres of water area for anchorage purposes. In view of the peculiar situation as to interior water routes in the Chicago region, a basin for breaking up and assembling barge fleets will be required in the vicinity of Joliet. The provision of this basin in adequate size will eliminate the necessity for an extensive anchorage area at the terminal site, so that the requirement of 220 acres could perhaps be reduced to about 100.

LOCATION AND DESCRIPTION.

There is no location along the Main Drainage Canal or the Chicago River between Loomis Street and Kedzie Avenue where there is either ample water front or sufficient land and water area available for a terminal development of the requisite proportions. From Kedzie Avenue west on the south bank of the canal is an undeveloped water front several miles in length and from 200 to 340-ft. in width, which is public property (Sanitary District of Chicago). A marginal wharf terminal development is practicable here provided the channel is widened to the south to 320-ft. The channel is now a little over 200-ft. wide.

The wharf required would extend along the widened section from a short distance east of Crawford Avenue to about a mile west of Cicero Avenue. Additional wharf could be provided by prolonging the widening indefinitely.

The anchorage basin is not to be obtained in the main channel, but a short distance to the south is the 240-ft. right of way of the Illinois and Michigan Canal. The canal was originally 60-ft. wide, but years of non-use have resulted in partial filling in. However, the dredging of a portion or all of this right of way to form one or more anchorage basins is a comparatively simple operation. To obtain the full extent, a section about three miles long would have to be improved; however, this would be a gradual development, and all of the estimated area might not have to be provided, and as the Santa Fe Railroad crosses the Drainage Canal a short distance to the west the basin could be widened beyond the point where it crosses. The basin should be connected to the main channel at intervals to permit ready circulation of traffic. It could be narrowed wherever bridges were necessary. All bridges over it and over the connecting passageways should provide 21-ft. of headroom.

The marginal strip owned by the Sanitary District of Chicago is wide enough to permit the widening of the main channel and still leave ample space for pier sheds, roadways, and connecting tracks.

Some land would be required in addition to that owned by the Sanitary District for necessary railroad yards. This land is available between Cicero and Crawford Avenues immediately south of the Illinois and Michigan Canal.

Direct rail connection would be possible with the Chicago and Alton Railroad, and Atchison, Topeka and Santa Fe Railway, but as these parallel the Illinois Waterway for some distance there would be little traffic to be interchanged with them.

Direct rail connection is also practicable with the Illinois Northern Railway, and also with the Belt Railway of Chicago east of Cicero Avenue. This latter connection is most important and one that should be made in preference to all others. By carrying the harbour railway along the Drainage Canal to the north-east, contact might be made also with the Baltimore and Ohio Chicago Terminal Railroad, the Pennsylvania Railroad, and the Chicago Junction Railway.

To provide ample clearance under all bridges over the anchorage basin and its approaches it will be necessary to raise the main line of the Santa Fe Railway a few feet. However, the raising of this railroad is involved in the extension of Cicero Avenue over the Chicago Drainage Canal, so that the additional elevation required to provide sufficient headroom is slight and not impractical to obtain at reasonable cost.

A portion of the commercial barge terminal business may ultimately be taken care of at Joliet, where the river fleets are to be broken up or assembled. Package freight in barge-lot shipments destined to or coming from points beyond Chicago, may be interchanged there, between barge and rail, by bringing the Elgin, Joliet and Eastern Railway to an appropriately located transfer house on the water front. Since many years will elapse before there will be enough of this transfer business to justify the construction of a special terminal, no action seems necessary at present with respect to it.

The demand for commercial barge terminal facilities in the Calumet region may be sufficient at some future date to justify their provision. The logical location for this class of terminal would be in Lake Calumet. As ample space is available there for many years to come, no special steps in this direction appear to be necessary at present.

The general conclusions with regard to the location of commercial barge terminals are therefore as follows:—

For commercial barge traffic: On the Drainage Canal near Crawford Avenue; and in Lake Calumet (ultimately).

For rail interchange barge traffic (ultimate): Lake Joliet.

INDUSTRIAL AND BULK INTERCHANGE HARBOURS.

An industrial harbour is a facility which provides access for water carriers to the immediate proximity of large industries where bulky commodities usually are received or shipped in full cargo lots. Industrial harbour facilities are to navigation as industrial sidings are to railroads.

A bulk interchange harbour is an arrangement for the transfer of bulk commodities between rail and water carriers.

The types of vessels that serve these two kinds of traffic are the same, as are also the kinds of cargo handling devices. The type of industry that is interested in harbour facilities is usually of a kind not desired in proximity to commercial and residential occupation; bulk interchange facilities operate to better advantage at locations free from congestion. Both types of harbour facility have enough in common, therefore, to make it desirable to consider them together in a study of this kind.

REQUIREMENTS.

If the industrial and bulk interchange harbours in the Chicago Region are to handle the traffic estimated for the future the requirements in Table 1 on page 379 must be fulfilled.

Grouping these additional requirements by location and type of vessel service, Table 2 on page 379, shows what should be supplied in the Chicago Region to meet the demands of the future.

CHICAGO RIVER BARGE TERMINALS.

On the Chicago River the necessary frontage for the service of barges may all be found in the so-called "Lumber District" near South Ashland Avenue. However, if there is a tendency for the traffic to decentralise there are several other locations along the North and South Branches, as well as along the Chicago Drainage Canal, which might be availed of as required.

THE USE OF CALUMET RIVER.

The Calumet River has considerable unused waterfront and acreage and in these respects could largely meet the requirements for the Calumet District. The limit of capacity is to be found in the channel, however, for there are bridges to be contended with and also a crooked channel.

Reserve capacities of existing installations and new ones actually under way will more than double the vessel movement on the Calumet River.

This would result in a greater number of arrivals and departures at the Calumet River terminals than there are now on the Chicago River. There are now 14 bridges over the Calumet River; the next 20 or 30 years will probably witness an increase in this number sufficient to make the stream a difficult one to navigate, particularly with an increase in the volume of water-borne commerce. The reasonable capacity of this stream as a channel between river terminals and Lake Michigan will be reached before most of the unused waterfront is utilised. Widening and straightening would ameliorate conditions, but the bridge interference would still exist.

LAKE CALUMET BARGE HARBOUR.

It is unsafe to look to the Calumet River for terminal facilities for lake vessels in addition to those to be provided in the normal expansion of existing establishments. It is, therefore, not proper to consider Lake Calumet as a future terminal for lake ships, since the capacity of the stream to pass the ships will be entirely utilised before the waterfront capacity of tracts along the river itself is exhausted and a demand created for sites in Lake Calumet.

Since the capacity of the Calumet River is in question it would be unwise to increase the vessel movement by locating industrial barge terminal facilities on it if other sites are available. To meet the estimated requirements for barges 8,250-ft. of water front and 80 acres of land are needed.

The Van Vlissingen plan for the improvement of Lake Calumet would provide 1,451 acres of land, 693 acres of water area, and about 70,000-ft. of water front if entirely completed as planned. The land is to be provided by dredging the slips and anchorage basin to a depth of 22-ft. A harbour belt railroad is to encircle the lake, serving all portions of the water front, and to which direct connections can be made by the Pullman Railroad, the New York, Chicago and St. Louis Railroad, the Chicago and Western Indiana Railroad, the Indiana Harbour Belt Railroad and possibly a few others.

This project would answer all requirements in the way of water front sites for industries desiring to utilise either lighters or barge service over the Lakes-to-the-Gulf Waterway for almost an indefinite period. The ratio of land to water area is apparently satisfactory, but there may be a

deficiency in total water front as compared to land area. However, slips may be added later on if ever necessary.

As far as the use of this harbour by barges and lighters is concerned there is no need of providing a depth of water of 22-ft. Fifteen feet of depth would be ample. However, the greater depth results in more material for filling purposes and is, therefore, a proper charge against the cost of the reclaimed land.

The railroad classification yards provided in Wolf Lake for the service of the Calumet Inter-State Harbour on the lake front are near enough the Lake Calumet development to serve a similar purpose for railroad traffic from the latter source. Contact with these roads would be made over the lines of the Calumet Western Railroad and the Chicago and Western Indiana Railroad.

INDIANA HARBOUR CANAL.

The Indiana Harbour Canal has an unused water front capacity of over 30,000,000 tons per year as regards wharf space, but perhaps not more than 10,000,000 to 15,000,000 tons as regards industrial sites. The addition of even the smaller tonnage might require a widening of the channel and the reconstruction of all of the bridges. The widening of the channel would not be difficult as a large proportion of the water front property is undeveloped. A greater width than 200-ft. would not be necessary if ships were berthed in slips leading off the channels, but even with such an arrangement the channel would be highly congested by the time all of the water front areas were fully developed.

The Indiana Harbour Canal might accommodate the tonnage required by the Jones & Laughlin site and the four oil refineries, and also take care of perhaps three to four million tons in addition for other industries. It cannot be counted upon for much more.

Of the total requirements in the way of industrial terminal facilities for ships the Indiana Harbour Canal could provide 200 acres of water front sites and 8,000-ft. of wharfage.

WOLF LAKE DISTRICT.

In addition to sites for new oil refineries, there would remain to be supplied in the Calumet District 355 acres of land, 16,430-ft. of water front, and 14,900,000 bushels of elevator storage capacity, after the Calumet River and Indiana Harbour developments had been used to capacity. Wolf Lake and the Lake Michigan front between the mouth of the Calumet River and Indiana Harbour are the remaining locations to be considered.

Wolf Lake and the lands adjoining it afford all that is to be desired in the way of area, frontage, and rail connections. It is close to Lake Michigan so that a short straight connecting channel can be provided. There is only one objection to its development, and that is the existence of three main railroad lines, one belt railroad, and an important highway in the narrow strip of land now between Wolf Lake and Lake Michigan.

The cost of either tunneling or raising these land routes appears to be greater than the difference between the cost of reclaiming lands from Lake Michigan and the cost of Wolf Lake property. The conclusion, therefore, favours the use of Wolf Lake and its immediate vicinity for harbour railroad yards, and perhaps for refineries which can make pipe line contacts with piers on the lake front, and the building of all the other harbour facilities on lands reclaimed from Lake Michigan.

The unoccupied lake front between the property of the State Line Generating Company and the old entrance to Wolf Lake should be the first to be developed.

About 3,000-ft. of unoccupied lake frontage are available for improvement at this location, and to utilise this limited area to best advantage the development should be at right angles to the shore. Lands for industrial sites would be provided by filling in the lake, preferably in large tracts as the industries to be served require considerable area.

The plan proposed contemplates the reclamation of about 450 acres of land separated into sections of about 75 acres apiece by slips 2,400-ft. long. In addition to a group of storage tracks to the south of these areas this industrial harbour development may utilise the large classification yards provided in Wolf Lake for the service of the commercial piers to the north of the industrial harbour.

Should the capacity of this improvement be exhausted a similar arrangement could be provided opposite the present shore of Lake Michigan south-east of Hammond's lake front park.

LAKE JOLIET BARGE HARBOUR.

Reference has been made previously to the need for a basin in the vicinity of Joliet for making and breaking fleets of barges. It has also been pointed out that when the through barge-to-rail traffic reached sufficient volume an interchange

TABLE 1. RESUME OF INDUSTRIAL AND BULK INTERCHANGE TERMINAL REQUIREMENTS.

Commodity or Industry.	Total Requirements.	Now in Use or Reserve.	To be Supplied.	General Location.
Grain	Elevator storage capacity of: 43,750,000 bushels	36,050,000 bushels capacity	7,000 feet frontage—50 acres of land—14,900,000 bushels storage of which 7,200,000 bushels capacity is to replace elevators on Chicago River	Calumet District
Lumber	5,000 feet waterfront 50 acres land	25,000 feet waterfront 150 acres land	0 0	Now available on Chicago River
Steel	30,000 feet waterfront 3,000 acres land	25,800 feet waterfront 2,620 acres of land	4,200 feet waterfront 380 acres land	Calumet District
Bituminous coal ...	29,070 feet waterfront 266 acres land	Indefinite—but known to be ample except for interchange business	For interchange between rail and lake only; 3,000 feet waterfront 50 acres land	Half at Michigan City Half in Calumet District
Anthracite	714 feet waterfront 8.3 acres land	Indefinite—but ample capacity at one terminal in South Chicago of 1,572 feet of waterfront—12 acres of land for storage	0	Calumet River
Sand, gravel & crushed stone	13,750 feet waterfront 100 acres land	6,600 feet waterfront 40 acres land	7,150 feet waterfront 60 acres land	Chicago River—4,000 feet and 35 acres Calumet River—3,150 feet and 25 acres
Petroleum products ...	4,200 feet waterfront	5,163 feet waterfront	0 Except for new refineries	Calumet District
Miscellaneous... ...	18,330 feet water front 170 acres land	0	18,330 feet waterfront 170 acres land	Chicago River—1,500 feet and 15 acres Calumet District—16,830 feet and 155 acres Near Joliet—indefinite requirements
Total			39,680 feet waterfront 710 acres land 14,900,000 bushels elevator capacity	

TABLE 2.

Requirements.	Chicago River. Barges.	Chicago River. Ships.	Calumet District. Barges.	Calumet District. Ships.	Michigan City. Ships.
Feet of waterfront	5,500	0	8,250	24,430	1,500
Acres of waterfront industrial sites	50	0	80	555	25
Elevator storage capacity, bushels	0	0	0	14,900,000	0

terminal in the same general location, with connection to the Elgin, Joliet and Eastern Railway, would be desirable.

Consideration of several possible locations along the Drainage Canal and Des Plaines River leads to the conclusion that Lake Joliet, the enlargement of the Des Plaines River three miles below the City of Joliet, answers all requirements to best advantage. This location offers ample water area free of cost except for drainage in isolated places; for inter-change business it saves one lockage as against a location between the Brandon Road Dam and the end of the Chicago Drainage Canal, and two lockages as against locations on the Drainage Canal. Direct rail connection is available with the Elgin, Joliet and Eastern Railway. In addition there is ample space along the banks for industrial sites should there be a demand for this type of facility.

The other locations considered are either lacking in space for storage and manœuvring of barges, or in suitable railroad connections, or also involve too great an outlay in initial capital expenditures for structures necessary to form anchorage basins.

OTHER IMPROVEMENTS.

The industries of Gary Harbour and on the Indiana Harbour Canal do not have direct access to the Lakes-to-the-Gulf Waterway, as there is no navigable interior channel to the Calumet River and the movement of river barges through the open lake is unsafe. These industries, therefore, will be required to lighter, switch, or truck their goods to and from barge terminals on the Calumet River and in Lake Calumet.

It would be advantageous to existing industries to have an interior waterway connection, and the use of unoccupied waterfront lands in the section affected would be stimulated.

This could be brought about by the widening and deepening of the Grand Calumet River between its confluence with the Little Calumet and its junction with the Indiana Harbour Canal, and the subsequent extension of this improvement to Gary. At one time it was proposed to improve this portion of the stream for the use of ships and an Act of Congress was passed in 1902 authorising the Secretary of War to receive deeds to the right of way for a rectified channel with a least width of 200-ft. Since there never has been a real demand for that type of improvement the government has not acquired the right of way, though it is understood that property owners on the Illinois section have signed agreements to deed the lands affected.

The Calumet-Sag Channel which connects the main drainage canal with the Little Calumet River near Blue Island, has a bottom width in earth section of 36-ft., and a minimum width in rock section of 60-ft. While this width is ample to start with, traffic exceeding about 2,000,000 tons per year will find the channel too small, and its ultimate widening will be a necessity. For this reason no encroachments nor permanent structures should be permitted to interfere with such widening.

The bridges over this channel are all fixed structures with a clear headroom of 16½-ft. This is ample for bulk commodity traffic, but foreseeing the ultimate establishment of commercial traffic in the Calumet Region all new bridges over this channel and over the Little Calumet between Blue Island and Lake Calumet, should provide at least 21-ft. of headroom.

SUMMARY OF GENERAL PLAN.

The general plan for industrial and bulk inter-change harbour facilities for the Chicago Region therefore involves:

Ships:

- Utilisation of unoccupied or reserve locations on the Calumet River and Indiana Harbour Canal as long as channel capacity permits.
- Construction of lake front industrial harbour near the former entrance to Wolf Lake.
- Provision of rail-lake inter-change facilities for coal at Michigan City.

Barges:

- Utilisation of unoccupied or reserve locations on the Chicago River.
- Improvement of Lake Calumet as an industrial harbour.
- Widening, deepening and straightening of Grand Calumet River from Lake Calumet to Gary.
- Widening of the Calumet-Sag Channel for its entire length.
- Provision of barge-rail inter-change facilities at Joliet.

(To be concluded).

RECORD DISCHARGE AT GRANGEMOUTH DOCKS.

On the arrival of the s.s. "Emsworth Manor" at Grangemouth Dock, the L.M.S. Railway, with six of their new electric cranes, unloaded 1,649 tons of tubes, bars and angles in the record time of 7½ hours. An average of 220 tons per hour.

NEW LONDON REPRESENTATIVE.

Messrs. Alex. Chaplin & Co., Ltd., of Glasgow, have appointed Mr. Anderson Rodger, 38, Victoria Street, Westminster, London, as their sole representative for London and district, and any enquiries for cranes (electric and steam—all types) can be sent to him or to them direct.

The Port of New Orleans.

NEW ORLEANS SHIPPING IN AUGUST.

While there was an 8 per cent. decrease in the number of deep-sea arrivals and departures at the port of New Orleans in August, 1928, as compared with the same month of 1927, the amount of merchandise passing over the wharves showed an increase of 13 per cent. on the basis of the same comparison. The business of the port, therefore, showed a most satisfactory increase. In respect to use of the inner harbour navigation canal, there was a large increase (18 per cent. in tonnage).

Of deep-sea vessels there were 249 arrivals and 240 departures, gross tonnage of arrivals amounting to 932,302, of which 714,441 used the public wharves, discharging and receiving 359,052 tons of merchandise thereat. This was an increase of 43,495 tons of merchandise as compared with the previous August. The public banana conveyors handled 2,087,474 bunches of bananas. The public grain elevator received 1,619,668 bushels of corn, wheat, oats and barley, of which 1,233,700 bushels were by rail and 385,968 by barge, and delivered 822,287, of which 147,294 were delivered through the public grain sacking wharf, an appurtenance of the elevator system.

There was no substantial change in the movement of river craft for the month. Of Mississippi-Warrior government barges there were 54 arrivals of 38,802 tons; of Mississippi-Warrior tugs, 22 of 18,636 tons; of other barges, 53 of 18,250 tons, and of steamboats, 89 of 11,152 tons. These are all river craft in excess of 25 tons.

RIVER MOVEMENT AT NEW ORLEANS FOR THE YEAR.

The arrivals of river craft of over 25 tons at the Port of New Orleans during the fiscal year ended August 31st, 1928, reached a grand total of 3,066 vessels of 1,149,377 tons. This compares with 2,445 vessels of 977,316 tons during the previous twelve months.

This movement consisted of 807 Mississippi—Warrior Barge line barges of 524,351 tons, 291 Mississippi—Warrior towboats of 233,811 tons, 847 other barges of 255,281 tons, and 1,121 river steamboats of 135,934 tons.

PILFERAGE DOES NOT EXIST ON NEW ORLEANS PUBLIC WHARVES.

"There has not been a single case of robbery or pilferage reported by any steamship line using our wharves during the fiscal year ending August 31st, 1928," states a special report of W. H. DeFrance, Superintendent of Docks for the Board of Commissioners of the Port of New Orleans. In fact, the records of the Superintendent show that there has not been a case of pilferage on the New Orleans waterfront in three years, and that only three minor complaints have been made in six years.

Prior to 1922, pilferage claims at New Orleans were upwards of $20,000 a year. In that year the Board organised a uniformed, armed patrol, actually inferior in numbers to its former patrol force, but with every patrolman required to pass mental and physical examinations corresponding to the strict requirements of the U.S. Navy. Iron gates were placed at the ends of all open-driveway sheds, so that all persons might be excluded at night or when ships were not working. (These gates do not interfere with access to ships by passageways and wharf-aprons, and they are not needed at all at the newer sheds, which have their driveways in rear). A 17-knot patrol boat, with two patrolmen on board at all times, was placed in service to break up "rat-nests" and prevent access of suspected or unauthorised characters.

Immediately on installation of these safeguards there was a cessation of theft. In 1923 two reports were made, and one of these was shown to be an inside job, perpetrated under the eyes of the steamship clerk, while the other was a loss of about $100. In 1924 there was no report of any kind. In 1925 there was one report of an inconsequential theft. In 1926, 1927 and 1928, there has not been a case reported.

TRAFFIC ON THE NEW ORLEANS INNER HARBOUR NAVIGATION CANAL FOR THE FISCAL YEAR.

Records of the Board of Commissioners of the Port of New Orleans show that there were 10,591 vessels of all classes that used the Inner Harbour Navigation Canal during the fiscal year ended August 31st, 1928, north bound and south bound combined. The total tonnage of these vessels was 4,101,123. There was an increase of 1,652 vessels using the canal, as compared with figures for the previous year, and an increase of 491,562 tons. These increases were in every class of vessel.

There were 1,292 transits by vessels of the Mississippi—Warrior River Barge Line, aggregating 588,459 tons, an increase of 204 vessels and of 59,874 tons in this class.

There were 581 ocean steamships which used the canal, aggregating 2,535,652 gross register tons, an increase of 118 vessels and of 215,560 tons in this class.

Of all other vessels there were 8,718 using the canal, aggregating a tonnage of 977,012, an increase of 1,330 vessels and of 216,128 tons.

COTTON WAREHOUSES OF NEW ORLEANS.

All weighing, sampling and inspection services heretofore performed by the Spot Handling Department of the New Orleans Cotton Exchange at the Public Cotton Warehouse and at other cotton warehouses of the port will be performed henceforth by the several warehouse forces, under supervision of the Cotton Exchange, and a uniform reduction of 20 cents a bale in the cotton warehouse tariffs of New Orleans has been made effective with the ratification of contracts affecting the Board of Commissioners of the Port of New Orleans and eight other cotton warehouse operators on the one hand and the New Orleans Cotton Exchange on the other. This information is contained in a joint statement issued by Colonel Marcel Garsaud, general manager of the Dock Board, and John F. Finke, acting chairman of the Cotton Exchange Spot Handling Committee.

" It is expected that the reduction in warehouse charges and improved methods of handling cotton in the port will attract increased quantities of the staple to the New Orleans market," says this statement. " Under the new arrangement there is preserved the system of reserve samples which permits sale and resale of cotton stored in New Orleans without physical rehandling, and which has permitted the merchandising of cotton locally at the lowest cost of any cotton market."

While details for the transfer of these operating services have only just been agreed upon, a general understanding was reached several weeks ago, and the arrangements have been effective from the date of September 1st, 1928. Since that date the warehouse forces have been performing the services in question, along with the services they have always performed, such as receiving, ranging, tagging, issuing of warehouse receipts, storage, compressing, repairing, patching, delivering, etc. In making the change, the warehouses took over from the Cotton Exchange forces the experienced men who have done the actual weighing, sampling and inspection in the past, and also arranged to purchase at a cost of approximately $30,0... all the physical properties which have been used by the Exchange in connection with these services.

The warehouses, by performing all services, now are able to co-ordinate their forces, expedite the movement, and minimise the expense of handling, especially by elimination of the fixed overhead expense which had to be met by the Cotton Exchange in operating a separate department.

Two contracts are involved in the changes. The first is between the Dock Board and the Cotton Exchange, and carries out certain legal provisions set forth by the State Legislature in 1915. By this contract, all samplers, weighers and inspectors at the Public Cotton Warehouse, from September 1st, 1928, are to be appointed by the Dock Board on the recommendation of the directors of the Cotton Exchange, licensed by the Exchange, and paid by the Board; the Cotton Exchange assumes responsibility for the accuracy and correctness of the weighing, sampling and inspecting, and agrees to maintain the necessary supervision; the services and expenses of the Exchange in maintaining supervision are covered by an agreed charge of two cents a bale on each bale weighed, sampled or inspected; the present practice of drawing double samples, top and bottom, and of holding one such sample in reserve by the Cotton Exchange is not disturbed, and the Board agrees to deposit the reserve samples with the Exchange; allocation of the value of loose cotton to owners is continued by the Board under the same system now practiced by the Exchange.

The second contract is between the Exchange and the nine warehouse operators—the Dock Board, Commercial Press and Warehouse Co., Federal Compress and Warehouse Co., Union Compress and Warehouse Co., Alabo Compress Co., New Orleans Compress Co., Stuyvesant Compress Co., Terrell Compress and Warehouse Co., and Union Compress Co. By this it is agreed that the services of sampling, weighing and inspection shall be performed by the warehouses, and that the Cotton Exchange shall exercise supervision; that the warehouses will purchase the equipment owned by the Exchange and, in general, the terms of this contract confirm those of the former so far as they may apply to other than the Public Cotton Warehouse. Right is reserved by the warehouses to maintain a reserve sample room, and under this clause arrangement is made for taking over the sample room of the Exchange, but at all times reserve samples are to be under supervision of the Exchange.

Warehouses concerned in this agreement aggregate a total storage capacity of over 900,000 bales of cotton. Four of them are shipside warehouses with direct connections over the public wharves operated by the Dock Board. Six are operated as Government bonded warehouses and issue Government negotiable warehouse receipts. There are thirteen high-density compresses in the several plants. The Public Cotton Warehouse, owned by the Dock Board, is the largest shipside cotton warehouse in the world, and has covered floor areas of 1,434,790 square feet, or nearly 33 acres, in addition to open space used for ranging fields and other purposes.

NEW ORLEANS BANANA IMPORTS.

During the fiscal year ended August 31st, 1928, New Orleans imports of bananas over the conveyors of the Port Commission amounted to 22,946,796 stems (or bunches), which is an increase of 1,284,030 over the number handled in the previous year. These bananas were brought from the tropics by 781 steamships, an average of nearly 30,000 stems for each arrival. There are 14 banana conveyors operated by the Port Commission at special wharves, where the fruit is handled direct from ship into car largely by belt conveyors, so that a cargo is dispatched by rail for interior destinations on the date of its arrival in port. Figuring 450 stems to each refrigerator car, it would require over 50,000 cars to move the banana imports of the past year—approximately 140 cars a day.

Practically every one of these fruit ships returns to the ports of tropical America, therefore the exporter can depend on an average of at least two sailings a day throughout the year, from the port of New Orleans.

To get a fair picture of what these imports mean to the population of the United States, each stem may be considered as carrying ten hands of 18 bananas each, which is an approximate average. On that basis, there were imported through New Orleans during the past year 4,130,423,280 bananas, or 34½ bananas for each man, woman and child in the country.

DOCK BOARD CONTRACT FOR FUEL OIL.

On September 13th the New Orleans Port Commission authorised a contract with the Sinclair Refining Company for furnishing fuel oil requirements of the Board for a period of one year, minimum 40,000 barrels, maximum 50,000 barrels, at 77 cents a barrel, or a total of between $30,800 and $38,500.

Launch of the Single-Screw Cargo Steamer " Tilsington Court."

Designed to carry about 10,800 tons total deadweight on a draft of 27-ft.

The single-screw cargo steamer " Tilsington Court," built by Sir W. G. Armstrong, Whitworth and Company, Ltd., for The United British Steamship Co., Ltd., was launched from the builders' Walker Shipyard on the 28th ult.

The " Tilsington Court " is of the two-deck type with freeboard and her principal dimensions are:—

Length between perpendiculars	...	420-ft. 0-in.
Breadth moulded	...	56-ft. 2-in.
Depth moulded to second deck	...	28-ft. 4½-in.
Depth moulded to upper deck	...	36-ft. 4½-in.

She is designed to carry about 10,800 tons total deadweight on a draft of 27-ft., and has been built to Lloyd's Highest Class.

The vessel has five large cargo holds, steel centre-line bulkhead and is arranged for the carriage of grain. There are 12 steel derricks fitted for handling the cargo.

A steam windlass is fitted on the forecastle, and eleven 7-in. by 10-in. steam winches are installed, four to each mast, two at the bunker hatch and one aft.

Steam steering gear is installed in a house at the aft end of the engine room.

The double bottom and fore and aft peaks are arranged for water ballast.

Complete electric light installation is fitted throughout the ship.

Accommodation for the captain is provided on the lower pilot bridge and the officers and engineers are accommodated in deck houses about the amidships.

The petty officers are accommodated in the forecastle and the seamen and firemen in the shelter 'tween decks aft.

The charthouse and wheelhouse and the wireless cabin are installed on the pilot bridge.

The main machinery of the vessel consists of a set of inverted direct acting triple expansion engines; and the boilers are of the cylindrical return tube type arranged for burning coal, with Howden's Forced Draught, and designed for a pressure of 180 lbs. The cylinder dimensions are 27-in.—45-in., 75-in. by 51-in. stroke.

CONTRACT PLACED.

The Aden Port Trustees have placed a contract with Messrs. K. L. Kalis, Sons & Company, Limited, dredging and reclamation contractors, Stone House, Bishopsgate, London, E.C.2, for the improvement of the entrance channel at Aden, and the extension of the inner harbour. This work will commence about the middle of December this year, and will be completed in about 3½ years.

Belfast Harbour Notes.

The death has occurred in Belfast of Mr. W. Redfern Kelly, J.P., M.Inst.C.E., formerly Chief Engineer to the Belfast Harbour Trust.

At a meeting of the Harbour Commissioners, the Chairman, Mr. R. E. Herdman, D.L., referring to the death of Mr. Kelly, said they had all learned with the deepest regret of the sad event. He was an old and valued official of the Trust, and many of those present had been associated with him for many years in affairs connected with the harbour while he held the position of Engineer. Mr. Redfern had a wide experience and he had seen the harbour grow from small beginnings to the vast proportions it had now attained. By the death of Mr. Kelly they all felt the loss of an old and valued friend. Concluding, the Chairman moved, "That the Belfast Harbour Commissioners place on record their deep regret at the death of Mr. Redfern Kelly, M.Inst.C.E., former Engineer to the Trust, and convey to the members of his family their sincere sympathy with them in their sad bereavement."

The resolution was seconded by Mr. R. A. Mitchell, and passed in silence.

The Belfast Harbour Commissioners observed the annual inspection of the properties of the Trust, the programme embracing a full-dress parade of the police force—the oldest organisation of its kind in Ireland—a visit to the numerous workshops connected with the harbour undertaking, and subsequently a tour of the docks on board the tug "Musgrave," and a lough cruise, which brought within its ambit all the buoys and lights, the lighthouse, and the pilot steamer "Edith Williames." There was a tinge of sadness attaching to the proceedings, for earlier in the day there had been laid to rest the remains of the late Mr. Kelly, who, for half a century had devoted his energies in the direction of the development of the port, which now comprises a land and water area of 2,308 acres, including a land area of 203 acres in the County Antrim side of the River Lagan and 580 acres on the County Down side, where, within the past few years big schemes of reclamation have been successfully carried out.

The police inspection was carried out in the courtyard, where there were on parade some 70 men, under the command of Major A. H. H. Armstrong, M.C.

Following the review of the ranks, Mr. Herdman, addressing the parade, said he would like to take that opportunity of saying to Major Armstrong and all present how very pleased the Commissioners were to see so fine a representation of the force on parade. The qualifications for the position of a police officer were not easy. First and foremost the character of the man must bear the strictest investigation, and he must then subject himself to a discipline which was almost military. Then, when he has gone through all the preparations to fit him to take up his post he had to show tact and discretion, and be able to rise to any emergency, and to deal with any unexpected circumstances. The Commissioners were singularly fortunate in the personnel of their police force, because it was by the rarest chance there was ever a complaint against any of its members. He was sorry that, during the year, they had lost by death one of their comrades. In conclusion he heartily congratulated Major Armstrong on the smart appearance of the parade, and on the high standard of efficiency the force had attained.

Pilots on shore duty were afterwards inspected. The Commissioners and officials later proceeded to the new Trans-Atlantic jetty on the Queen's Quay, and boarded the harbour tug "Musgrave" (Captain Porter), on board of which vessel, later in the day, a statutory meeting of the Commissioners was held.

At the meeting of the Belfast Harbour Board, Mr. R. E. Herdman, D.L., Chairman, presiding, the report of the Harbourmaster (Captain McIntyre) for the fortnight from 19th August till 1st September, stated that 301 vessels arrived at the port as follows: Coastwise and cross-Channel, 270, foreign 20, non-trading 11; the total tonnage of the vessels which arrived from 1st January to 1st September, was as follows: Coastwise and cross-Channel, 1,548,122, an increase of 33,802; foreign, 404,870 an increase of 18,768; a total of 2,002,711, or a net decrease of 3,759.

The minutes of the Traffic and Navigation Committee, which were adopted, stated that Messrs. John Kelly, Ltd., had requested that a reduction be made in the rate for weighing small lorries on the Commissioners' weighbridges, and it was recommended that a charge of 3d. per load, not exceeding three tons of rough goods, as detailed in the schedule of rates, be made.

In the minutes of the Works Committee it was stated that a letter was read from Mr. H. T. Rea, secretary, Lagan Navigation Company, intimating that a shoal had formed in the channel of the River Lagan, before the first locks, Stranmillis, causing lighters navigating the river to ground at frequent intervals, and requesting that the place be dredged. A report from the engineer thereon was also read, and the matter having been discussed, it was recommended that the necessary dredging be carried out.

Weddell's River and Harbour Sounding Machine.

This machine is designed to be bolted over a well, or to the gunwale of the boat from which the soundings are to be taken, and gives direct and accurate dial readings of the depth much more quickly and with less labour than by the older methods of sounding-rod or leadline. It consists of a strong galvanised malleable cast-iron casing, carrying on a spindle a gunmetal

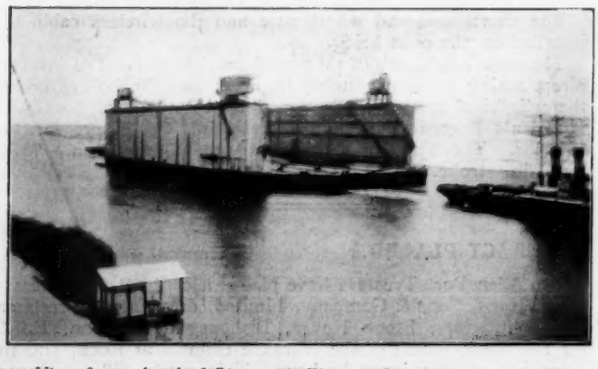
Weddell's Sounding Machine.

barrel 2-ft. in circumference, from which a lead weight of about 14-lbs. is suspended by a flexible phosphor bronze or steel wire cord. The barrel is rotated by a handle to lower or lift the weight, and indicating dials, which are completely enclosed in the casing, show the depth in feet and tenths of a foot. The dials are readily adjustable to zero with the weight at the surface of the water when commencing to take soundings, so that no correction of the readings is necessary.

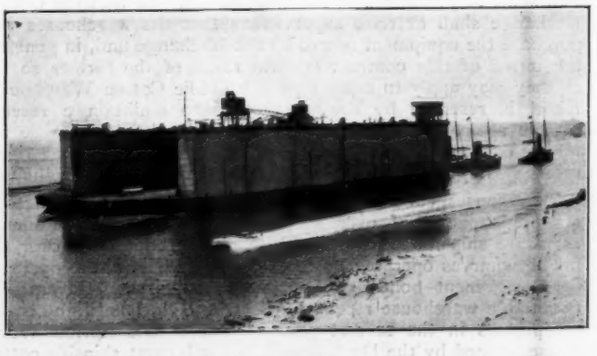
The standard machine is made for sounding to a depth of 100-ft., and weighs about 50 lbs. exclusive of the sounding weight.

It was originally designed for the Engineers' Department of the Clyde Navigation Trust, and has been in continuous use by them for about twenty years, as well as by other Harbour Authorities and Engineers throughout the world.

Further particulars can be obtained from George Russell & Co., Ltd., Motherwell.



View from ahead of Singapore Floating Dock passing through Suez Canal.



View from astern of Singapore Floating Dock (172-ft. beam) passing through Suez Canal. The Suez Canal Co.'s 40-knot speed boat can be seen passing alongside.